The Chemical Age

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Billingham Synthetic Ammonia Process

THE annual report of the British Sulphate of Ammonia Federation, to which we referred last week, is a singularly interesting document, and it is certain that no single notice can adequately cover the many important considerations raised. Reference has already been made to the creditable achievement of the Billingham company. When we are assured by experts that the problem of the production of synthetic ammonia has not yet been solved, that, at the moment, there is no eminently satisfactory process for the production of hydrogen when regarded from an economic point of view, we find it difficult to reconcile these observations with the actual achievement of Synthetic Ammonia and Nitrates, Ltd.

It is generally appreciated that the economic production of hydrogen is a vital factor in the success of any process for the production of synthetic ammonia. But it has to be remembered that the Brunner-Mond organisation is marketing its synthetic gaseous product as sulphate of ammonia, and we are credibly informed that sulphuric acid as such is not being used, but that the SO_4 radicle is obtained from anhydrous calcium sulphate, large quantities of which abound in the precincts of the Billingham works. Evidently the reaction on which the Billingham sulphate of ammonia depends is:—

$$CaSO_4 + 2NH_3 + H_2O + CO_2 = CaCO_3 + (NH_4)_2SO_4.$$

It will be seen that carbon dioxide is required in the reaction, and this can be obtained either as a by-product from the hydrogen plant or from waste gases, large quantities of which are undoubtedly available in the neighbourhood.

Calculations suggest that the SO_4 radicle can be obtained from anhydrous calcium sulphate at less than half the price at which sulphuric acid has been selling to sulphate of ammonia manufacturers during the period covered by the report under notice. If this is the case, then the information which has reached us would appear reliable, and it seems clear that when an economically sound process for the production of hydrogen has been developed the position of the Billingham company will be materially strengthened, and its production of synthetic ammonia, already substantial in quantity, will assume a formidable figure.

That there is plenty of scope for the increasing use of sulphate of ammonia in this country is made evident by a study of continental figures. Per acre of arable land, Germany uses approximately two and a half times more nitrogenous fertiliser (sulphate of ammonia) than this country, while Holland employs seventy per cent. more than Germany. The British farmer can with advantage take a lesson from the continent, as indeed from the work of our own agricultural colleges and experimental stations, where it has been demonstrated that increased yields of almost all crops accompany the judicious application of fertilisers. It is certain that the consumption of sulphate of ammonia, no less than that of other fertilisers, is far below what it should be.

Education for Industry

CAPTAIN BAIN, in his address at Widnes on "Industry and Education," dealt with the subject not merely from the employers' point of view, but in the spirit of a real educationist. The theory of cheap child labour he rightly dismissed as obsolete, and, pleading generally for a higher standard of education, he pointed out that an educated man, if he cost more, gave more. Similarly in regard to research, he warned business men that, though direct monetary results of research could not be exactly counted on, the firm that regarded research merely as a luxury to be dropped in the lean years were inviting well-deserved disaster. It is well to have such views stated by men of influence, for in commerical circles the common view of research and education still falls considerably short of the liberal standard Captain Bain's address represents.

There was, among other useful suggestions, one on what is called vocational training, which cannot be too strongly emphasised. Real educationists, we fancy,

will be heartily in accord with Captain Bain's view that any attempt at vocational training before the age of 14 is simply waste. The fancy theory of teaching mere children a tit-bit of science, a fragment of art, a few words of French or German, or the first stages of a trade instead of concentrating on a few elementary necessaries like the three R's, probably accounts for the lack of thoroughness in the products of our modern schooling. From the kindergarten up, the child's mental energy is dissipated over a range of subjects so wide that none is really mastered. The system makes for shallowness where depth is wanted, for a superficial knowledge of many things instead of a thorough grasp of the essential few. And the habit of making the lesson as easy and attractive as possible instead of training the young mind to do the necessary tasks, not because they are pleasant but because they have to be done, means certain disillusion when a youth begins serious work. In business and in life generally the pupil will find much that is unpleasant that has still to be faced, and the training which predisposes him to the pleasant and indisposes him for the difficult is false because it is untrue to actual life.

The attempt to teach children half their future trade in school is turning out a mistake. The longer they spend in purely educational preparation and the later they begin their specialised training for a selected career the better will be the result all round. Captain Bain has really got the hang of the problem.

Sulphur as a Fertiliser

ALTHOUGH the whole matter must still be considered as in a more or less experimental stage, there is a good deal of interest attached to the unobtrusive work which is being carried out in connection with the employment of sulphur as a fertiliser. The time has, of course, by no means arrived for the general application of sulphur in lieu of the more familiar fertilisers, but there would seem to be something in the suggestion that sulphur deficiency in certain cases may be responsible for indifferent results which are usually ascribed to other causes. Much of the present-day interest in the matter is to be found in America, where attention has been directed to the possibilities of sulphur by French experiments which were carried out some ten or fifteen years ago. In the main, the French studies were concerned with the fertilising action, both direct and indirect, which sulphur exerts in the soil; but the American experience has been along somewhat different lines, an attempt having been made to classify and record the increased production derived from the application of sulphur, while a good deal of work has centred round the control of soil diseases by means of the same material.

It must be admitted that the whole position as regards both fertilising action and ultimate effect is decidedly indefinite, and it is, perhaps, scarcely possible to agree as yet with the assertion that in some soils sulphur may be a limiting factor, and that crop increases which have followed the application of superphosphates or sulphate of ammonia are probably due to the sulphur content rather than to the phosphoric acid or nitrogen of such materials. It is, moreover, particularly difficult to find any specific opinions as to the proper amount of sulphur to apply, although Dr. H. Clay Lint, of the Texas Gulf Sulphur Company, has recently quoted results which place the quantity between the rather wide limits of 275 and 450 lb. per acre. He states, moreover, that the application should take place in the autumn, but it depends upon the characteristics of the soil as to whether it should be a surface treatment or a deep application. It is, however, as well to bear in mind the opinion of Mr. C. C. Fletcher, of the U.S. Bureau of Soils, to whose work we drew attention in these columns early in the present year, who stated that an application of 40 lb. per acre had been found satisfactory. Quite recently Professor Marcard, of the Bordeaux Faculty of Sciences, has published a thesis on the use of sulphur as a fertiliser in which he draws the following conclusions:—(1) that sulphur placed in the soil transforms itself not only into sulphuric acid, but also into hydrogen sulphide in certain conditions; (2) this hydrogen sulphide contributes to the partial disinfection of the soil, facilitates the ammonification of organic compounds, and opens the way for active nitrification the following spring; and (3) sulphur is not only a disinfectant, but is also a fertiliser, the useful effects of which should be more completely brought to light by numerous practical tests in diverse soils.

B.S. Classification of Oils

FOLLOWING the issue of the British Standard Specifications for Fuel Oils for Heavy-Oil Engines, the British Engineering Standards Association has now published a B.S. Classification of Pure Mineral Oils. This classification is intended to be a broad guide to users of pure mineral lubricating oils to enable them to describe their wants more precisely than is now frequently done. The meaning of the terms "Light," "Medium," "Heavy," etc., as applied to lubricating oils is clearly stated in terms of definite ranges of viscosity, thus removing all doubt in the minds of users of oils as to whether these terms refer to the viscosity or to the specific gravity of the oil. Typical specifications for each type and grade of oil are given, but it is not intended that these specifications should be used as purchasing specifications. The classification has been made under the following four main heads: (*a*) Machinery and engine oils (pale or red); (*b*) Internal-combustion engine oils (pale or red); (*c*) steam cylinder oils (dark), and (*d*) Steam cylinder oils (red). Oils containing fatty oils have not been included. Extentensive notes are given indicating the purposes for which each grade and type of oil is best suited, together with full details for the testing of the oils, the methods of testing described being those recommended by the Institution of Petroleum Technologists. This classification should prove useful as a guide in drawing up specifications for oils for particular classes of work, for which purpose the typical specification given for the corresponding type of oil should, if necessary, be narrowed down to suit the purpose in view, and additional clauses added setting forth the special characteristics required. Copies of the publication (No. 210, 1924) may be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, 1s. 2d. post free.

Hopes of Reviving Trade

On many sides one hears hopes expressed of a revival in the textile industry, to be followed by a corresponding fillip to the chemical and dyestuff industries. It is not so easy to discover exactly what this feeling of confidence is based on, but it is fairly general. The speculator is at present very much interested in the prices of textile shares, and manufacturers and merchants are looking forward to an increasing flow of orders. This confidence in itself is a good feature, and if it proves justified the effect will be undoubtedly favourable to the chemical industry. The first effect, of course, would be an immediate demand for dyestuffs, which would be distinctly welcome in that section of the industry. The good effect, however, would not be confined to dyes; it would be general. Side by side with the improvement in the textile trade there are the possibilities of development in the artificial silk industry. This is restricted to a certain extent at present by the limited range of dyes applicable to the fabric, and as the range is gradually extended it is reasonable to suppose an extension of the industry. Generally it may be said that the British chemical industry is not complaining very much at present, but after the quiet time which has been experienced since the end of the post-war "boom" an increase of sustained activity as distinct from spurts would be welcome. And sustained activity obviously depends on stable conditions at home and abroad, of which, fortunately, there is at last a reasonable prospect for some time to come.

The Gospel of Work

The reminder that Sir John Brunner gave the other day at Northampton of the strenuous work which attended the foundation of the business of Brunner, Mond, and Co. is worth repeating. In the early days of the firm, he said, it was common for his father and Dr. Ludwig Mond to work six days and three nights a week. They went to bed on the other four nights and slept most of Sundays. It was only in this way that the difficulties they encountered could have been overcome, and one may add that only in this spirit can work of any real quality be done. The fixing of an eight-hours day and the deliberate restriction of output may, indeed, have been a natural reaction against a condition of excessive hours at low wages that formerly existed. The unfortunate thing is that the minimum standards tend to become the maximum, and the workman with ambition or pride in his craft has to be content with limits imposed by the capacity of the slowest and the poorest of his colleagues. The trade unions have gone a long way towards protecting the worker who could not protect himself; but they have yet to discover a method of helping the average or those a little below the average without penalising the worker possessed of extra skill or initiative. A system which deliberately imposes limits on the brain or hand activity of capable workers, and kills energy and enthusiasm required for the refreshment of business, cannot be good either for the worker or for industry.

Points from Our News Pages

The chemistry of synthetic sweetening compounds is dealt with in an article by Mr. G. Malcolm Dyson (p. 572).

A letter is printed on "Chemical Works Costs," by Mr. Harold Calam (p. 574).

A practical review of modern conditions in industry and education is given by Captain Bain, of the United Alkali Co. (p. 575).

A discussion on protective paint coatings and a Cantor lecture on modern colour problems are reported on p. 576.

Our London Chemical Market records an uneventful week, but business continues satisfactory (p. 584); a little improvement in the Heavy Chemical Market is recorded by our Scottish market report, also notable reductions for next year (p. 587).

Books Received

The Elements of Colloidal Chemistry. By Herbert Freundlich. Translated by George Barger. London: Methuen and Co., Ltd. Pp. 210. 7s. 6d.

The Rare Earths. By S. I. Levy. London: Edward Arnold and Co. Pp. 362. 18s.

Fuel. By J. S. S. Brame. London: Edward Arnold and Co. Pp. 388. 18s.

Physics in Industry. Vol. II. Lectures delivered before the Institute of Physics by J. W. Mellor, A. E. Oxley, and C. H. Desch. London: Humphrey Milford. Pp. 48. 3s.

Patents: Invention and Method. By Harold E. Potts. London: The Open Court Co. Pp. 160. 3s. 6d.

The Calendar

8	Ceramic Society: "Notes on Crushing and Grinding Mills." F. Lane. 7.30 p.m.	Central School of Science and Technology, Stoke-on-Trent.
8	Royal Society of Arts — Cantor Lecture (III): "Modern Colour Problems." Louis C. Martin, 8 p.m.	John Street, Adelphi, London.
9	Faraday Society: Group of papers on "Base Exchange in Soils." 4.30 p.m.	Burlington House, Piccadilly, London.
9	Hull Chemical and Engineering Society: "Oil Fuel Burning and its Advantages in conjunction with Coal Firing." G. Urquhart Morgan. 7.45 p.m.	Grey Street, Park Street, Hull.
9	Northern Polytechnic Chemical Association: "Rubber from the Plantation and Economic Points of View." P. J. Burgess. 8 p.m.	Holloway.
9	Sir John Cass Metallurgical Society: "Metallurgical Processes in Minting." Sir Thomas K. Rose.	London.
9	Society of Dyers and Colourists (Leeds Junior Branch): "The Tinctorial and Antiseptic Properties of Certain Types of Quinoline Dyestuffs."	Leeds.
9	Society of Chemical Industry (Birmingham and Midland Section): "The Rôle of Silica in Plant Growth: Its Assimilation and Physiological Relation to Phosphoric Acid." D. R. Nanji and W. S. Shaw. 7.15 p.m.	University Buildings, Edmund [illegible] Street, Birmingham.
10	Institute of Chemistry (Manchester Section): Concert 7 p.m.	Engineers' Club, Albert Square, Manchester.
11	Institute of Metals (London Section): "Present Problems and Developments in Engineering Bronze Foundry Practice." F. W. Rowe. 7.30 p.m.	85–88, The Minories. Tower Hill, London,
11	Optical Society: Extraordinary General Meeting. 7.30 p.m.	Imperial College of Science and Technology, South Kensington.
12	Institute of Metals (Swansea Section): Discussion on the "Design of Furnaces for Annealing and Heat Treatment." 7.15 p.m.	University College, Singleton Park, Swansea.
12	British Chemical and Dyestuffs Traders' Association, Ltd.: Meeting 3.30 p.m.	The Accountants' Hall, Spring Gardens, Manchester.

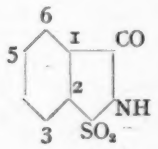
The Chemistry of Synthetic Sweetening Compounds

By G. Malcolm Dyson, B.Sc.

In the following article the author reviews the recent advances that have been made in the attempt to establish a theory connecting the structure with the sweetness of synthetic organic bodies. The method of preparation of saccharin is also reviewed.

THE human craving for sweetness in foodstuffs persists even when the digestive apparatus is incapable of dealing with the sugar ingested, and so accustomed are our palates to the habitual sweetness of our food and drink, that deprivation of sugar is a real hardship. Consequently, in pathological cases such as diabetes, or in times of limited sugar supply—as, for example, in the recent war—the chemist is called upon to devise a substitute, which will emulate the sweetness of sugar, and at the same time be without the disadvantages of that substance. There are, of course, many substances that are known to chemistry, which are possessed of a sweetish nature, but only few of them really imitate the sweet taste of sugar, having at the same time no deleterious or toxic properties.

The point that interests both the pure and commercial chemist is the relation between the constitution of such compounds and their sweet taste, and it is not usually known that a considerable amount of detailed research has been done on this subject, and that numerous theories have been advanced correlating taste and structure. The work of Cohn and Holleman is responsible for elucidating a great deal of valuable information with regard to the taste of various saccharin derivatives. Research in this direction may be divided into two main branches—the first, pursued chiefly by Cohn, dealt with the influence of foreign substituents on the taste of saccharin.



Saccharin.

Cohn introduced the four halogen elements successively into the "4" position of saccharin, and observed that the compounds so prepared had the following properties :—

Compound.	*Taste.*
4-Fluosaccharin.	Extremely sweet, with a slight bitter after-taste.
4-Chlorosaccharin.	Fairly sweet, with a marked bitter after-taste.
4-Bromosaccharin.	Slightly sweet, with a marked bitter after-taste.
4-Iodosaccharin.	Slightly bitter.

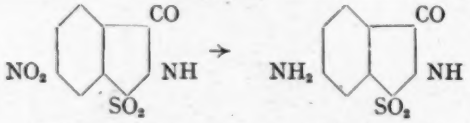
It is apparent from the table above that the sweetness increases with decreasing molecular weight of the entering halogen group—to which may be added the fact that saccharin itself is sweeter than any of its halogen derivatives.

Influence of Position of Added Group

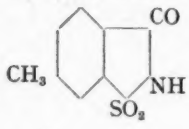
It remained for Holleman to determine the influence which the *position* of the entering group has on the sweetness of the product. Although he was unable to prepare 3-chlorosaccharin he prepared the other possible isomers, and observed that they had the following properties :—

4-Chlorosaccharin.	Fairly sweet.
5-Chlorosaccharin.	Only feebly sweet.
6-Chlorosaccharin.	More than half as sweet as saccharin, but with an astringent after-taste.

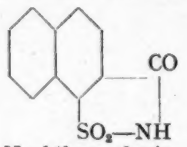
In addition he found that the introduction of various other groups into the benzenoid nucleus of saccharin resulted in extremely large modifications of the taste of the products. Nitrosaccharin is intensely bitter, but its reduction to amino-saccharin furnishes a compound which is even sweeter than



Nitrosaccharin. Aminosaccharin.



Methylsaccharin

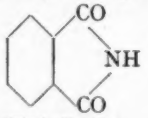


Naphthosaccharin.

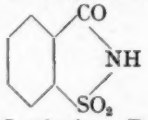
saccharin. The introduction again of alkyl groups seems, as might have been expected, to have little or no effect on the sweetness of the product; so that methyl- and ethyl-saccharin are comparable in sweetness with the parent body. It may be noticed in passing that the alkyl groups modify the after-taste of the compound, rendering it, in the case of saccharin, slightly less aromatic. However, in contradistinction to the inertness of the entering alkyl group, the fact has been recently ascertained that the naphthalene analogue of saccharin has a bitter taste.

Multiplication of Sweetening Groups

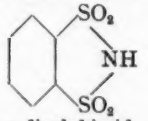
The second main line of research that has been pursued with some considerable success, by Holleman, is that if multiplying the number of "sweetening" groups in the compound. It may be argued that since phthalimide is tasteless, and



Phthalimide.

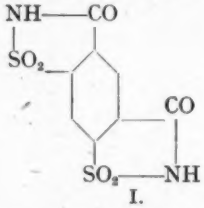


Saccharin.

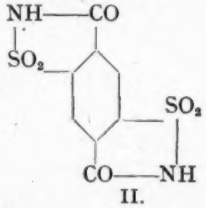


Benzene-o-disulphimide.

saccharin sweet, then the sweetness of the latter is due in some way to the presence of the SO_2 grouping, but on introducing two SO_2 groups a substance is obtained, benzene-o-disulphimide, which is only half as sweet as saccharin. The sweet taste could just be perceived at a dilution of 1 : 1000, so that its sweetness was of the same order as methyldulcin (p-anisyl-urea). A further series of experiments elucidated the fact that the multiplication of the saccharic groupings is not always associated with an increase of the sweet taste. For example, of the compounds indicated below I had a definitely bitter taste, while II had a sweetish astringent taste, in no



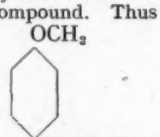
I.



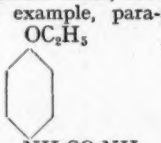
II.

way comparable with that of saccharin.

With compounds of this type it has been noticed that the replacement of an oxygen by a sulphur atom, or of a sulphur by a selenium or tellurium atom, reverses the taste of the compound. Thus for example, para-anisyl urea (I), and



I.



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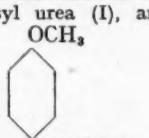

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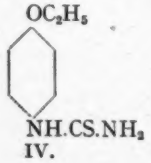
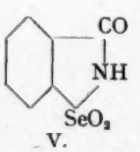


IV.



V.

paraphenetyl urea (II) are sweet, but the corresponding thioureas (III) and (IV) are bitter, and, moreover, selenosaccharin is definitely bitter to the taste.

Sweet Aliphatic Compounds

No account of this subject is complete without some reference to the work of Sternberg (Geschmack und Geruch.), and of Oertly and Myers, on the sweet taste of aliphatic compounds. Sternberg points out the interesting generalisation, that for an aliphatic compound to be sweet, the alkyl groups must not outnumber the hydroxyl groups by more than one, or the combination will be bitter. He adduces numerous examples in support of this, among them the fact that while rhamnose is sweet, methyl rhamnoside is bitter :—

CH_3 CHOH.CHOH.CHOH.CHOH.CHO

Rhamnose.

CH_3.CHOH.CHOH.CHOH.CH.OH.OCH_3

O

Methylrhamnoside.

Again it has been pointed out—also by Sternberg—that the sweetness of a compound increases with the number of hydroxyl groups present. Thus, glycol is sweet, but not so sweet as glycerol, which in turn isle ss sweet than glucose.

The fact that obtrudes itself from consideration of these facts is that a small difference in structure has a comparatively large influence on the sweetness of a compound, a fact which is observed among other phenomena relating to physiological action. Thus while saccharin is five hundred times sweeter than sugar, the corresponding para- compound is tasteless. Consequently general regularities have been hard to trace, and, to date, no thoroughly satisfactory theory of taste and structure has been brought forward.

A Theory of Taste

Oertly and Lyers have brought forward a theory of taste which is akin to the more usually accepted theory of colour and constitution. Thus, they postulate that taste is dependent on two factors—two chemically distinct groups, the presence of which in conjunction is necessary to the sweet taste of the compound. These two groups they term " glucophore " and " auxogluc "—a terminology that has been borrowed from the colour constitution analogy. They define a " glucophore " as a group of atoms which has the power to form sweet compounds with a number of otherwise tasteless groups or atoms—these latter being the " auxoglucs." The following groups are found to be glucophores in their sense :—

(1) --CO--CHOH (*H)
(2) --COOH--$CHNH_2$
(3) $=C\begin{matrix}/H_3\text{-}x \\ \backslash (Halogen)x\end{matrix}$
(4) CH_2OH--CHOH--
(5) CH_2--O-NO_2

The (*H) in the glucophore (1) is meant to signify that the groups must be attached to one hydrogen at least before the glucophoric function can be realised. The following groups are deemed to be auxoglucs :—

(1) Hydrogen.
(2) Alkyl carbon chains, such as CH_2. CH_2. CH_2 . . . .
(3) Monohydric alcohol residues, *e.g.* CH_2OH. CH_2 CH_2. .
(4) Polyhydric alcohol residues, *e.g.* CH_2OH. CHOH. . . .

They adduce a large amount of evidence to show that the combination of a glucophore with an auxogluc produces sweetness ; but their theory has many disadvantages—among them the fact that it takes no account of the many aromatic substances, among them saccharin, whose sweetness cannot be so easily explained. In the second place the definitions of auxogluc and glucophore are so loose and vague that it is difficult to find a compound that cannot be made up from them—in fact, nearly all the aliphatic compounds known to us would be predicted on this theory to be sweet—although in reality but a few of them are.

This theory, then, must be accepted with some considerable reserve, for although it offers a convenient way of summarising the main phenomena of the subject, it explains little, and its rules are more often broken than followed. Furthermore, the whole subject is confused by the two facts that the mechanism of taste has not been satisfactorily explained, and that the taste of a compound is a property that cannot be definitely measured. The theory has been put forward that taste is an ionic phenomenon—and indeed, the similarity in taste of the various acids tempts us to ascribe it to the hydrogen ion —but it is difficult to see how this theory can explain the difference in taste between dextro and and lævo isomers.

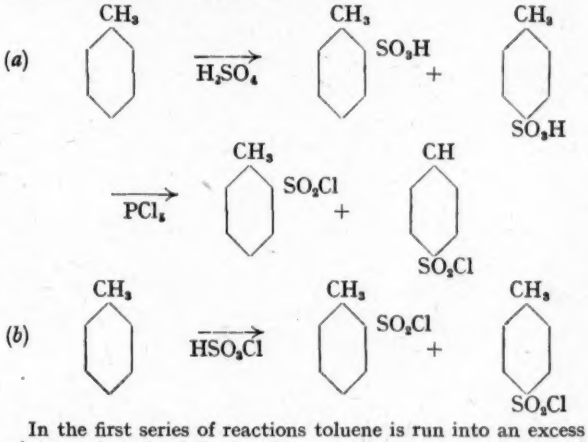
Preparation of Saccharin

Among the substances that have been prepared for sweetening purposes, saccharin stands out as by far the most important, and I propose to deal with the compound in some detail, before proceeding to other and less commercially important compounds. Saccharin, known pharmaceutically as " gluside," and chemically as benzoyl-o-sulphimide, has been formulated above, and is prepared in large quantities for medical use. The processes used may be divided for description as follows :—

(1) The conversion of toluene to toluene-sulphonchloride.
(2) The conversion of the chloride to the sulphonamide.
(3) The oxidation of the sulphonamide to saccharin.

Preparation of the Sulphonchloride

In this step, the toluene sulphonchloride can be produced in either of two ways . . . by the sulphonation of toluene to the sulphonic acid—by the usual sulphonation process—and conversion of the sulphonic acid to the sulphonchloride by the action of phosphorus penta-chloride, or by the direct treatment of toluene with chlorsulphonic acid. In either case a mixture of isomers is formed, which at some stage in the manufacture has to be purified.



In the first series of reactions toluene is run into an excess of concentrated sulphuric acid contained in a cast-iron vessel provided with a stirrer. It was found that the maximum yield of orthotoluene-sulphonic acid was obtained by carrying out the sulphonation at 0° C. and that the relative proportions of the three isomers formed were :—

o-Toluene sulphonic acid	.. ..	40 per cent.
m-Toluene sulphonic acid	.. ..	4 per cent.
p-Toluene sulphonic acid	.. ..	56 per cent.

Consequently in order to favour the production of the ortho-compound the reaction mixture is cooled by coils through which cold brine circulates. In addition, it may be added that the presence of charcoal or infusorial earth hastens the reaction. After stirring for about 12 hours the reaction is finished, and the ortho- and para-toluene sulphonic acids are separated. Early on in the history of the process this was done by neutralising the mixed acids with milk of lime, converting the mixed calcium salts into the sodium salts, and the separating by fractional recrystallisation. Better methods have been evolved, and where this process of direct sulphonation is adopted it is usual to separate the mixed acids by one of the two following processes. In the first of these the reaction mixture is neutralised with either magnesium or zinc oxide, and separation effected by fractional crystallisation of the zinc or magnesium salts. In the second process the mixture is diluted with ice until the amount of sulphuric acid present

is about 66 per cent. by weight. On cooling this mixture the para-sulphonic acid separates out leaving the ortho-acid in solution.

The separated acids are converted into their sodium salts, and thence into the sulphonchlorides by treatment with phosphorus trichloride in a stream of chlorine. The phosphorus oxychloride so formed is removed by distillation, preferably under reduced pressure, and the oil remaining is cooled to 0°C. At this temperature any remaining para-compound solidifies and can be removed. In spite of this the oil remaining contains at least 15 per cent. of the para-compound.

This method of obtaining the sulphonchloride is rapidly being supplanted by the second process, described above, which consists in treating toluene with chlorsulphonic acid. In this process four parts of chlorsulphonic acid are placed in a cast-iron vessel provided with stirring and cooling apparatus, and one part of toluene is run in at such a rate that the temperature of the reaction mixture does not rise above 5° C. By this means a mixture of the two isomeric sulphonchlorides is obtained. The bulk of the para-compound is removed as a solid by cooling to 0° C. leaving an oil which contains approximately 85 per cent. of the ortho-compound.

Preparation of the Sulphonamide

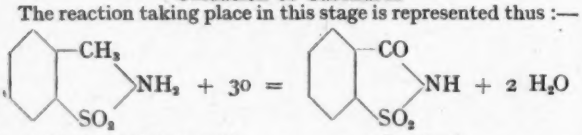
For the conversion of the sulphonchloride into the sulphonamide, ammonia as the gas or aqueous solution, or ammonium carbonate can be used. The majority of manufacturers prefer the carbonate which is ground up with the crude sulphonchloride to give a thick paste. The paste so obtained is treated with live steam to complete the reaction, and the crude sulphonamide is filtered from the solution of ammonium chloride which remains. This crude substance consists of 85 per cent. of the ortho- and 15 per cent. of the para-compound, and separation of these is effected in the following way. The crude compound is dissolved in an exact equivalent of caustic soda solution, of about 2 per cent. strength, and the solution is raised to the boiling point. Sufficient hydrochloric acid is then run in to precipitate 75 per cent. of the dissolved compound. On cooling the pure ortho-sulphonamide is obtained alone, the purity of which approaches 98 per cent.

It is interesting to note, in passing, that the para-isomer is not wasted, but is worked up in the large-scale production of Chloramine-T, which is having a deservedly wide success as an antiseptic.

Other methods have been used for the separation of the ortho- and para-sulponamides (such as the fractional precipitation with ammonium chloride, or fractional crystallisation of the magnesium salts), but they have not attained commercial importance.

Oxidation to Saccharin

The reaction taking place in this stage is represented thus :—



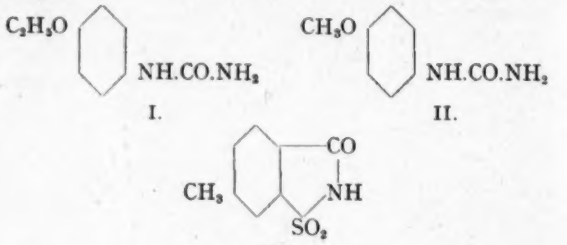
o-Toluene sulphonamide. Saccharin.

The sulphonamide is dissolved in caustic soda solution of a strength N/2.5, an exact equivalent of the alkali being used. The neutral solution is placed in a lead-lined vessel, and warmed to a temperature of 40°-50° C. Powdered potassium permanganate is then thrown in until a faint pink colour persists, indicating that the reaction is at an end. The excess of permanganate is removed by the addition of a small quantity of sodium hydrosulphide solution, and the liquid portion is filtered from the precipitated manganese mud. After cooling to about 15° C. the solution is made neutral by the addition of hydrochloric acid. At this stage any unchanged sulphonamide separates and can be filtered off. The saccharin is then precipitated by the addition of hydrochloric acid to the filtrate.

The saccharin is usually purified by solution in dilute alkali and reprecipitation with acid. In practice the sodium salt of saccharin is often preferred, for sweetening purposes, since it is more easily soluble in water.

Other Commercial Sweetening Agents

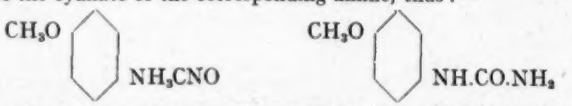
Among other substances that have been commercially introduced as sweetening agents, the following three are most commonly met with (I) " Dulcin " or para phenetyl urea ; (II) " Methyldulcin " or para anisyl urea ; and (III) methy saccharin.



I. II.

III.

The two former—dulcin and methyldulcin are about 200 times as sweet as sugar, while the methyl saccharin is slightly sweeter than saccharin itself. The compounds, para anisyl urea and para phenetyl urea, are prepared by boiling a solution of the cyanate of the corresponding amine, thus :—



These compounds are of comparatively slight commercial importance, since the great bulk of the demand is satisfied by saccharin, although to a sensitive palate dulcin has a softer taste, and is without the aromatic after-taste so characteristic of saccharin.

The use of such compounds is limited—and rightly so—by the heavy duty imposed on saccharin, etc. (indeed, in many countries its use in foodstuffs is prohibited) since their unlimited use to replace sugar in ordinary diet, deprives us of a natural and valuable food, substituting in its place a comparatively worthless substance.

Chemical Works Costs

To the Editor of THE CHEMICAL AGE.

SIR,—There is a matter raised in your report of my discussion of the above which I would like putting more clearly. With your kind permission I wish to emphasise the following :

" Even if the cost of manufacture of an intermediate is actually the price at which the same material can be bought on the market, including the cost of delivery right to the plant where it otherwise would be made (including any cost of assay), it would be better to manufacture if thereby labour would be employed and on-cost would be picked up instead of the plant standing idle."

This, of course, applies to products other than intermediates.

The price to be charged for, or credited to, intermediates is more subtle, and the policy to be adopted varies with circumstances, its full bearing requiring careful consideration.

Taking the firm's " power services " as a species of intermediate, if power " at cost " can be obtained at a lower price than a local outside supply it may favour manufacturing, whereas if the power house is allowed to show a profit, manufacturing may be deterred. Really, as long as the whole job shows a profit it does not matter whether it is made on the power used or on the article manufactured, in the long run.

In thanking you, may I congratulate you on your very excellent and prompt account of the proceedings.—Yours, etc.,

HAROLD CALAM,
Fine Chemical Department,
Boots Pure Drug Co., Ltd.

West Bridgford, Notts,
November 26.

The Chandler Medal

THE Chandler Medal awarded annually by Columbia University for services to science is this year to be presented to Professor E. C. Kendall, in charge of the Chemical Division of the Mayo Foundation of the University of Minnesota. Holders of the medal include Dr. L. H. Baekeland, of New York, now president of the American Chemical Society ; Dr. W. F. Hillebrand, U.S. Bureau of Standards ; Dr. W. R. Whitney, Schenectady, N.Y. ; Dr. F. Gowland Hopkins, and Dr. Edgar F. Smith, Provost-Emeritus of the University of Pennsylvania.

Industry and Education

Captain Bain's Review of Modern Conditions

THE first of a series of autumn lectures arranged by the Widnes Chamber of Commerce was one on "Industry and Education" by Captain Bain, a director of the United Alkali Co. Among those present was Dr. G. C. Clayton, M.P., another director of the company.

On our educational policy, Captain Bain said, depended the future of the race, not only as the greatest moral driving force in the comity of nations, but as the greatest industrial and commercial nation in the world. By industry he meant the whole of that complex organisation by and under which nearly all of them lived. The view of the older-fashioned business man on modern education fell as a rule into one or more of three classes: The first, that the boys he got from school could not figure or write as they used to in his day; the second that expenditure on education was grossly extravagant; and the third that the system of compulsory free education was nothing but a breeding ground of discontent among the people. To-day there was another view held by probably the most influential and most thoughtful men of industry. They might say, with some justification, that the boys who came into their business were insufficiently prepared, and that results did not justify the vast amount of money spent annually on education. But he did not adopt a "non-possumus" or definitely destructive attitude. He accepted the responsibility of business and industry, and was prepared to co-operate, with a view to improvement in the schools, and to welcome co-operation and help in dealing with the problem of those already in industry. For the problem of to-day was an industrial problem.

Before the passing of the Factory Acts the supply of child labour was considered to be one of the industrial assets of the country. Conditions had improved, but they suffered to-day from the evils of the past. Education had been shackled to the wheels of industry, neglecting the true aim of education. There was developing in our industrial world a new feeling of social responsibility. Definite headway had been made towards co-operation, but, unfortunately, in the past, such movements had tended to be class movements. The problem of our time was to obtain co-operation between the different organised classes. Up to date businesses were encouraging and developing education of the younger pupils in work hours; they gave financial assistance to educational bodies. They realised that to do so was good business; that an educated man, though he cost more, gave more.

Research a Necessity

An axiom of successful industry was that the last thing to cut was expenditure upon research. It was at times difficult to prove to the business man the direct monetary results of research; but, nevertheless, it was certain that the firm that regards research as a luxury to be discarded in the lean years would end in well-deserved disaster. It was certain that to-day the ordinary applicant for a business appointment was selected not on his examination passes but for mental alertness and force of character.

There were several steps necessary for the improvement of our present system. The most important of these was the reduction in the number of people in any given class; then the present distinction between elementary and secondary schools should be removed. Attendance at school should be compulsory until at least 16 years of age. The elementary school system should be revised to form a complete course preparatory to continuation classes for those entering business or more advanced schools for those proceeding to the university. The Central School system seemed one of the most promising developments towards that continued education which was necessary for the proper equipment of those who must enter industrial life.

Dealing with unemployment, Captain Bain said there were one or two ways in which it could be approached by the Board of Education. Raising the age up to 16 would certainly lessen the actual figure of unemployment, and was in the right line of educational advance. The other direction was in the development of secondary education though not necessarily in secondary schools. As to the question of vocational training, he was utterly unconvinced as to the value of any vocational bias to education before the age of 14. He agreed that it was vital that school curricula should be so devised as to equip those leaving school to earn their livelihood. But only after 14 should what may be termed vocational differentiation begin. The problem of vocational training seemed likely to be most successfully tackled along the lines laid down in certain of our big retail stores. For too long a period a more intimate relationship with industry had been denied, because of the failure of the co-operating parties to understand the other's difficulties. It is certain that there was never a greater will to co-operate than at the present time, and it was to the local authorities that they must look for a lead in the matter.

A discussion followed, and the proceedings closed with a cordial vote of thanks to Captain Bain.

Rubber Plantation Research

Major Eaton on Practical Problems

MAJOR B. J. EATON, F.I.C., gave a paper on "Research Work on the Plantation" before a meeting of the Institution of the Rubber Industry (London Section) at the Engineers' Club, London, on Monday evening. Mr. P. J. Burgess was in the chair in lieu of Sir Stanley Boyce, chairman of the London Section, who was unavoidably absent in Holland.

Major Eaton said that the subject of research on the plantation was a very big one. In Malaya it had been shown that this work was best carried out by the scientist, who could co-ordinate his results from over a wide area. Field research covered experiments on planting methods, tapping, physiological problems, and fertilisers. Many of these entailed laboratory work—analysis of soils, investigation of disease and so on. It would necessarily be many years before some of the facts were established in connection with tapping and planting. As regards tapping, the effect of the removal of the latex on the physiology of the tree was still unknown.

In Malaya the question of the organisation of rubber research was still *sub judice*, but a scheme was now sanctioned which he believed practically followed his own ideas. He pointed out that plantation research was impossible for individual estate owners, but should be co-ordinated by some central body over a wide area. The costs of the research organisation should be borne by the industry as a whole or partly by the Government if it saw fit.

Effect of Fertilisers

Plantation research had done much during the past 10 or 15 years in securing uniformity of the raw product. A few years ago the question of "brown bast," a disease now known to be due to excessive tapping, was the pressing problem on the plantation. At present vegetative reproduction was the great question, and he regarded the development of disease-resisting plants as of great importance. With regard to fertilisers it was noticeable that most tropical soils were acid but did not seem to need lime. Ammonium salts and nitrates were, however, sometimes found to be most valuable in improving yields.

Major Eaton appealed to manufacturers to put their difficulties with the raw product before the plantation research organisations, who were very often in a position to discover the causes of certain properties in the raw product which might cause anxiety to manufacturers.

In connection with latex, Major Eaton mentioned that in the methods of preserving it with ammonia it was a remarkable and unexplained fact that ammonium phosphate separated out in considerable quantities, so that evidently preserved latex underwent some chemical change.

Major Eaton concluded by an interesting reference to the growth of gutta percha in Malaya. This product was now attracting interest there, and the problem was how best to grind up the leaves of the plant to get the gutta percha. It was a very curious point that with the use of some types of grinder it was impossible to extract dry gutta percha afterwards although with others a full yield was obtained.

Lubricators

Two folders issued by J. B. Treasure and Co., Ltd., of Vauxhall Road, Liverpool, illustrate some of the many British-made productions of this firm of lubricating specialists. Gauge glasses, glass protectors, rings, washers and other accessories are described and illustrated.

Protective Paint Coatings

A Practical Discussion on Paint Components

A JOINT MEETING of the London Section of the Society of Chemical Industry and the Oil and Colour Chemists Association was held in the rooms of the Chemical Society, Burlington House, on Monday, to discuss the question of protective paint coatings. Dr. Bernard Dyer, chairman of the London Section, was in the chair and was supported by Dr. H. Houlston Morgan, President of the Oil and Colour Chemists' Association.

The Metallurgist's Standpoint

Sir ROBERT HADFIELD opened the discussion by giving a brief account of the various theories of the corrosion of iron, but added that in spite of all the work on the problem of corrosion there was at present no general agreement as to the fundamental principles involved. He was really speaking as an anti-paint man because the major problem in corrosion which concerned the metallurgist was to provide cheaply alloys which would resist the attack of the active constituents of the atmosphere of an industrial town, of sea or river water, or of other chemical agents by virtue of their own properties and not the properties of their chemical compounds nor the properties of protective paint coatings. A striking advance in this direction had been made by the introduction of alloys of iron with chromium, whilst more recently alloys of iron containing both nickel and chromium offered resistance over a much wider range and were not merely unattacked at ordinary temperatures but were scarcely affected at red heat or even at higher temperatures.

Dr. R. S. MORRELL explained a number of lantern slides and discussed the question of water absorption and permeability of varnish films. Among the results he showed was a lower water absorption with a higher percentage of linoxin in an elastic film. He also showed that the greater the amount of polymerised oil the less would be the water absorption, whilst the general presence of metals which formed soaps, like lead, tended to increase the water-absorbing properties. Other slides showed the effect of salt water on the absorption by a varnish film, and the apparatus used in preparing varnish films and testing them. Low water-absorbing properties were necessary.

Mr. C. A. KLEIN said that the word protection in the connection in which it was then being used had only a relative meaning because the paint and varnish trade to-day was not in a position to give a supply of paint material that would be protective against all sources of corrosion and under all conditions for all time. The whole problem was an economic one. The labour cost of applying protective materials was 75 per cent., whilst the material represented only 25 per cent. of the total cost. Therefore it was useless saving 6d. on a gallon. At the same time the great majority of faults arising from the use of paints were due to bad craftsmanship.

Dr. J. J. FOX said that having regard to the difficulty of applying chemical analysis to paints in order to arrive at results in a reasonably quick time, it was said to be necessary to turn to physical tests, and the point then arose as to the best type of physical test to adopt. One valuable test of this nature was the weighted needle test. There was also the plasticity test and Dr. Morrell's emulsifying test.

The Need for Practical Tests

Mr. C. JENNINGS emphasised the need for service tests, the material being applied by skilled craftsmen working under the supervision of chemists. A great deal of work on these lines had been carried out in America and such tests should imitate practical conditions.

Dr. H. H. MORGAN said there was no doubt that the industry was at sixes and sevens on the subject of protective paint owing to the complexity of the conditions relating to it. The whole difficulty was that many people insisted upon regarding one item as important to be investigated, whereas in his opinion the paint as a whole must be considered. He did not suggest that other investigations should not be carried out, but although it was essential to test the film, the medium, the pigment and so on, from the point of view of a technical evaluation of a paint, it must be tested as a whole.

Dr. L. C. Martin on "Colour Problems"

Second Cantor Lecture

IN his second Cantor Lecture at the Royal Society of Arts' London, on Monday, dealing with "Modern Colour Problems," Dr. Louis C. Martin dealt at some length with the psychophysical basis of colour measurement. In spite of apparent complexity the principle of the colour constancy of visual objects was sufficiently accurate under ordinary conditions to make a demand for some means of specifying the colour of an object in terms of a few symbols which could not be misunderstood. It required little imagination to realise the field of usefulness for such a nomenclature or notation. In the future, therefore, we might imagine a South African merchant wishing to place in Great Britain an order for a fabric of an unfamiliar colour of which he possessed a sample. He would have available an instrument which would give him the colour in some international code, and he would telegraph the order with the certainty of obtaining what he wanted, and he would not have to wait until his sample was transmitted by post. If such a system could be made available, its importance to Great Britain with its great textile and chemical industries would be extremely great. The subject of colour measurement, therefore, had a very considerable practical interest.

The lecturer discussed the variation of colour sensations in order to investigate the possibility of evoking them by the application of physical stimuli which could be analysed in simple terms, and described Abney's colour patch apparatus of 1891 in which a carbon arc was used as a source of light. The famous discussions of colour vision of such men as Helmholtz, Maxwell, Konig, Dieterici and Abney, following upon the work of Young, were indicated, although time did not permit of their full development, and it was added by Dr. Martin that although we were still unsure of the actual mechanism of colour vision, the theory and measurements based upon it could be used with advantage in many problems of colour measurement.

The colour triangle used by both Maxwell and Helmholtz—originating apparently out of a suggestion by Young—was then demonstrated, it being pointed out that the use of graphical methods originated with Newton, who proposed the use of a colour circle and described a graphical means of determining the results of colour mixtures. Had his experimental apparatus been of a more perfect description, Dr. Martin said we should have gone very far in developing the theory of this subject.

Industrial Applications

The lecturer concluded with some reference to the industrial and scientific operations in which colour measurement was being developed as a convenient method of control. In the colour and dye industries, and in the drapery trades, the application of colour measurement was, of course, of first importance, and any system used must be applicable over the whole range of colour. One of the most interesting modern questions was the investigation of the fading of colours and dyes under various conditions. The mercury arc in quartz, suitably screened with filters of thin glass, was successfully used to imitate sunlight, and methods were being rapidly developed. In this connection there was a useful field for improved methods of detecting and measuring the amount of fading, and this clearly should be done by colour measurement. The tintometer had been successfully applied in this connection. In many chemical investigations and also in a considerable number of industrial processes, colour measurements were useful, but there was often no necessity to use systems applicable over the whole range of colour. To take a single example, sugar manufacturers, tanners and others might wish to compare examples of brown liquid for depth of colouration, and there was no necessity to adopt expensive systems or instruments covering colours which were never encountered. In an increasing number of pathological methods, colour measurements were finding an increasing employment, and here again measurements over limited ranges were called for as a rule. Several systems had been developed for the measurement of colours of low saturation, and such measurements were of importance in connection with the manufacture of flour, cement and other "white" products.

The Dyeing of Acetate Silk

Joint Meeting at Nottingham

THE Nottingham Section of the Society of Chemical Industry held a joint meeting with the Society of Dyers and Colourists on Thursday, November 27, Mr. S. H. Pentecost presided.

Mr. G. H. Ellis in a paper on "The Dyeing of Acetate Silk," said that chemically cellulose-acetate might be considered more acidic than cellulose itself, as indicated by its strong attraction for bases, which if sufficiently strong would regenerate hydrated cellulose. This attraction extended to organic bases, but as many of them had mutual solvent action upon cellulose-acetate it was difficult to determine what was chemical combination and what was merely physical solution. However, the qualities of Celanese both as a fibre in wear and in relation to dyestuffs and other processing treatments were the cumulative effect of these two broad sets of properties.

The earliest cellulose-acetate fibres of a number of years ago as, shown by dyeing records, only took up basic colours substantively after drastic treatment to swell the fibre. In the early days of Celanese (which was the registered trade mark of the British Celanese, Ltd.) attempts were made to use ordinary dyestuffs such as direct cotton colours, and these were very unsuccessful with artificial yarns. In England the method of saponification or hydrolysis was elaborated, whilst in Switzerland the dyeing was done with simple basic colours without mordants, using inorganic salts for heavier shades, as, for example, magnesium chloride. In practice the saponification method was difficult to control, the dyer was working in the dark, faults were not apparent until the end of the operation and were then beyond correction. A considerable amount of the saponification was completed during the first five minutes, which meant an extremely sensitive process, which on account of its rapidity resulted in irregularity. Unevenness became greatly accentuated, since any portion of the surface first attacked by alkali subsequently absorbed more and became further hydrolysed in preference to the remainder. There was also a substantial loss in weight and some effect on the lustre, resistance to abrasion and so on; hence the saponification method was considered unsuccessful.

Mr. Ellis outlined results obtained with a variety of well-known existing commercial dyes.

The Solution to the Problem

The ultimate solution to the problem lay in the synthesis of colours specially for cellulose-acetate which theoretical deductions showed would have to be molecularly simple, generally basic in nature, but certainly not strongly acidic or salt forming. It appeared certain that such colours would be insoluble in water, and it became necessary therefore first to devise a method of "solubilising" such insoluble compounds. A method was conceived by means of which it was possible to obtain physical or colloidal dispersion of these water insoluble colouring matters. Many colouring matters answering to the above principles would be oil soluble and the use of sulphoricinoleic acid seemed promising, since it had the properties of an oil and in the form of its alkali salts was a very powerful protective colloid in aqueous dispersion systems. Thus simple colours were dissolved in hot sulphoricinoleic acid, and the solution diluted down to suitable dyebath strengths. The method was next extended to cover unsulphonated fatty acids, neutralisation being first necessary to give salts miscible with water. Subsequently the methods were elaborated, and new discoveries made. The same principle holds throughout to obtain a high degree of solution in pre-treatment and to prevent subsequent aggregation or coalescence in the aqueous dyebaths.

The results of much research had led to what were known as the "S.R.A." colours. Mr. Ellis described the individual dyeing properties of certain colours in practical dyeing, and the general fastness properties of the "S.R.A." colours, which were shown to be exceedingly good.

The special compounding method employed for these colours as now marketed was such that they were no more trouble in dissolving than the usual colours of commerce. Besides being miscible together the "S.R.A." colours could also be mixed with direct cotton colours and applied in the same dyebaths, and as they did not dye cotton or any other artificial silks, mixed goods might therefore be dyed with various effects such as solid shades, two tone effects or bi-colours. The "S.R.A." colours did not dye animal fibres. Mr. Ellis showed examples of di- and tri-coloured fabrics, and indicated the application of "S.R.A." colours to printing.

Future Fuel Oil Resources

Supplies of Natural Petroleum Far from Exhausted

AT a meeting of the Institution of Petroleum Technologists, held on Tuesday, in London, at the Royal Society of Arts, Professor A. W. Nash, of Birmingham, described some investigations carried out by himself and Mr. H. G. Shatwell on the hydrogenation of coal in the course of a paper surveying the "Fuel Oil Resources of the Future."

With regard to the future of natural petroleum deposits the authors stated that ten years ago American technical journals were seriously warning the world that unless care was used the available supplies would soon be exhausted. Yet in America the output of oil had increased, and, in fact, seven new oil-fields had been discovered there. The geology of petroleum deposits had been more closely studied, and it seemed now to indicate that more fields might be discovered, while, thanks to systemised drilling, the fairly recently discovered Persian oil-fields showed no signs of exhaustion, and oil was continuing to flow naturally without pumping. On the whole, then, the outlook for natural petroleum was not unfavourable.

Even in an "exhausted" field the probability was that there still remained more petroleum than was ever obtained from it. The work of De Chambrier at Pechelbronn on the extraction of oil from exhausted oil sands by mining with shafts and galleries showed that the amount of oil that could be extracted by this means was roughly five times that which had been obtained previous to the alleged exhaustion.

Oil Shales

Oil shale deposits were known to exist throughout the world, and they were little worked, mainly because it was not economic to do so when petroleum was so plentiful. When the demand for petroleum began to exceed the supply then oil shale would become established as a source of fuel. The problem of obtaining oil from the shale ought, however, to be tackled before that time.

Cannel coals and torbanites were also capable of producing appreciable quantities of fuel oil on distillation, while the tar obtained from distilling lignites contained mainly petroleum products.

Coal as a Source of Oil Fuel

Many misleading statements had been made, said Professor Nash, during recent years regarding the value of coal as a source of oil fuel. Oil obtained by the low temperature carbonisation process could never replace petroleum because it contained no lubricating fractions and at the same time had too high a percentage of phenolic bodies. Also the oils were mainly unstable, unsaturated compounds. According to figures obtained by the Fuel Research Board the quantity of oil obtained per ton of coal carbonised would be about 7½ gallons. Nevertheless, if all waste coal were so treated a valuable addition to the country's oil resources would be made.

Professor Nash considered that the hydrogenation of coal formed a much more promising method of obtaining fuel oil. Bergius had found that by hydrogenating a coal containing not more than 85 per cent. of carbon at 400° C. to 500° C. at pressures of 100 atmospheres and over, a liquid product was obtained closely resembling crude oil. At Birmingham the authors of the paper had carried out a number of experiments on these lines, using the separated constituents of ordinary coal—clarain, durain, and fusain. It had been found necessary to employ a liquid medium, and a hydrogenated mineral oil was taken for some experiments and phenol for others. Varying proportions of oil were obtained in this way, with only a small quantity of phenols under certain conditions. It was established definitely, by carrying out blank experiments with nitrogen, that hydrogenation of the coal took place directly, the function of the added oil or phenol not being clear. There seemed no doubt that the process could be developed practically.

Hydrogenation of fuel oil residues with object of producing fuels with a lower carbon-hydrogen ratio than normal cracked spirit was also a promising practical method.

It was the authors' opinion that alcohol could never replace petroleum, although its possibilities should not be ignored.

Somersetshire Shales

A second paper, by the same authors in association with Mr. Ivon Graham, was read by Mr. Shatwell. This dealt with the Somersetshire oil shales, which are a continuation of the South Wales series. The shale seams varied in thickness from 1 ft. to 20 ft., and the easiest method of winning them would seem to be by quarrying. Dry distillation was found to give the best yields, as against steam distillation, in the case of Scottish shales. The yield of oil was from 5 to 10·4 gallons per ton against 22·4 to 24·14 gallons from the Scottish shales. In addition, the yields of gas and ammonia were low, and it seemed unlikely that the shale residues would be available for cement manufacture. Some of the fractions obtained on distillation of the crude oil required drastic treatment, and even then the result was unsatisfactory.

A New Cement for Roads

Tests of "Ferrocrete" to be Used for First Time in London

A GATHERING of cement experts, engineers and others is expected at the City and Guilds Engineering College, Exhibition Road, South Kensington, on Monday afternoon, December 8, to see mechanical crushing tests of blocks made of a new English cement. They will be subjected to pressures sufficient to break them, and the breaking point will be carefully noted. It is expected to be about 350 tons per square foot. The new cement is to be used in the repaving of Piccadilly between Park Lane and Brick Street, on which work began on Monday last. This practical demonstration of a new British discovery promises to be of first-rate importance in cheapening and speeding up urgent road repairs.

The relaying of streets (of concrete foundation) in the busiest thoroughfares demands the use of the quickest hardening cements in order that the street may be "up" for as short a time as possible. The ordinary cement takes ten to fourteen days to harden, and hitherto for the quickest hardening variety this country has been dependent on imported supplies, particularly from France, where an aluminous cement, known as "Ciment Fondu," of extra rapid hardening qualities is produced. The new English product "Ferrocrete," though a true Portland cement and less than half the cost of the foreign product, has quick-hardening properties comparing so favourably with the foreign cement that the municipal authorities responsible for the work have decided to use it in one of London's busiest thoroughfares. In theory, the new cement requires a slightly longer hardening period than the French product, for it hardens sufficiently to bear traffic in 48 hours, as compared with 24 hours. But in practice this difference is negligible, because owing to the interval necessary for laying wood blocks over the cement foundation of a road and top-dressing them with tar and grit, it is impracticable to send traffic over a new cement foundation in less than 48 hours, even if the concrete bed were sufficiently hard to stand the strain.

The section of Piccadilly to be repaved measures 250 yards, and the work will be done in two longitudinal halves, the north side first. Up to Down Street the French cement will be used, and for the remaining 125 yards English cement. The southern half will then be completed, with the two different cements used in like proportion.

"Chemical Warfare Again"

PROFESSOR GIUSEPPE BRUNI, of Milan, writes: "Having read in your issue of November 22 your interesting editorial note, 'Chemical Warfare Again,' I take the liberty of sending you a reprint of the inaugural address delivered by myself on this subject at the National Congress of Industrial Chemistry held here last April." The address contains views on the subject of chemical warfare very similar to those of Sir William Pope and General Fries, referred to in our leader of November 22.

Chemical "Merchants" Sentenced

Fraudulent Trading with Chemical Manufacturers

AT the Manchester Assizes, on Friday, November 28, judgment was delivered in a case in which Roy Coleman, Edward Albert Coleman, and Harold Stanley Davenport, partners in the firm of Coleman Bros., general merchants, of Moss Lane, Hulme, Manchester, were charged with fraud or, alternatively, with false pretences in order to obtain credit or goods from a number of firms. The goods included various consignments of chemicals bought from the United Alkali Co., Ltd., Sciama and Co., the Landore Zinc Works, Ltd., Swansea, the Pure Oil Co., William Broadfoot Clarke, and Messrs. Joseph G. Watson (Manchester), Ltd.

Mr. A. J. Ashton, for the prosecution, said it was alleged that between February and May of this year the firm obtained the goods on credit on representations that it was a genuine concern, whereas, said counsel, it was a fraudulent business carried on by people who went all over the country buying a variety of things not paid for, which they sold immediately after delivery at less than buying prices. The origin of the concern was a small cattle food business carried on by the two Colemans at Hulme. In February last a limited company, which included Davenport, was formed, with a nominal capital of £1,000. Later the three wives of the accused were made debenture holders, and when the concern was wound up in May last a receiver was put in on behalf of the debenture holders. None of the creditors mentioned in the charges had been paid for their goods.

Edward Albert Coleman, said the firm has been called upon to pay heavy legal charges. When the firm became insolvent he invited certain firms to take their goods back. Goods to the value of between £800 and £900 were thus returned. Debenture holders had renounced all claims to the assets in order to benefit the creditors. Owing to misconduct Davenport was discharged in May last.

The jury found each of the accused guilty. Mr. Justice Mackinnon sentenced Edward Albert Coleman and Davenport each to 14 months' imprisonment, and Roy Coleman to 10 months' imprisonment. Davenport admitted two previous convictions for false pretences.

Atomic and Molecular Structure

THE fourth of a series of public lectures on "Atomic and Molecular Structure" was given on November 26 by Dr. J. D. Main Smith, at the Chemistry Department, Birmingham University. The lecturer, after outlining the classifications of the elements, directed attention to the non-existence of any general classification of compounds, and proposed a comprehensive system of classification embracing all types of organic, inorganic, simple, and complex compounds, basing it on Werner's co-ordination theory, in which molecules are regarded as complexes each consisting of atoms closely bound to a central atom.

All known compounds of ascertained constitution fall into only four main types, having central atoms with the co-ordination numbers 2, 3, 4 and 6. Each type is divisible into sub-types according to whether the maximum number of atoms in a plane is 2, 3, 4, 5 or 6, and further divisible according to whether the co-ordinated atoms are or are not in cyclic structures, *i.e.*, whether the central atom is or is not combined with chelate groups. Four classes of chelate compounds were distinguished, with chelate groups to the number of 3, 2, 1 or none, each class being subdivided according to the number of similar atoms or groups in the co-ordination number. Illustrative examples were given from all classes of chemical substances, and it was shown that the classification united compounds of organic and inorganic chemistry into one harmonious system.

Following on the stereo-conceptions involved by these structural types, simple explanations were given for general and optical insomerism, and a simple mechanism suggested for optical activity as due to the rotation caused by the mere reflection of a plane wave of light at the surface of atoms in molecules, the resultant net effect of all reflection rotations being in a preferential direction owing to the asymmetric arrangement of the atoms.

It was also shown that the co-ordination theory led to an exact knowledge of the whole structure of molecules and of the superficial features of the structure of atoms.

From Week to Week

MR. F. TWELLS has been appointed a director of Ayrton, Saunders and Co., Ltd., manufacturing chemists, of Liverpool.

THE MEETING of the Institution of Chemical Engineers which was to have been held on Wednesday, December 10, has been cancelled.

THE ROYAL SOCIETY has awarded its gold medal for distinguished services to Professor Haiaer who, after 25 years, is retiring from the chair of organic chemistry at the Sorbonne.

IT IS OFFICIALLY STATED that the Government has decided to adopt and carry out the proposals of the late Government for the grant of subsidies for the beet sugar industry in this country.

BIRMINGHAM'S NEW TECHNICAL LIBRARY was formally opened by the Lord Mayor on Monday. The library of about 4,000 volumes already contains much of interest dealing with the chemical and allied industries.

MR. C. F. RATCLIFFE, managing director of Brotherton and Co., Ltd., chemical manufacturers, and Mr. H. A. Watson, managing director of Tunstall and Co., Ltd., manufacturing chemists, have been appointed to the Commission of the Peace for Leeds.

MR. A. C. BURNS, who until recently was senior chemist to the Egyptian Government, has been appointed head of the chemical department of the Midland Agricultural and Dairy College, Sutton Bonnington, in place of Mr. H. T. Cranfield, who has been appointed advisory chemist.

AN EXPLOSION IN AN AMMONIA LIQUID TANK at Fishburn, near Stockton, on Sunday night, resulted in the death of a coke-oven foreman. It was suggested at the inquest that the man struck a match to ascertain the depth of the liquid instead of using the regulation safety lamp.

THE ANNUAL DINNER of the Birmingham and Midland Sections of the Society of Chemical Industry and the Institute of Chemistry will be held on Saturday, December 13. Professor G. T. Morgan will preside, and the guests will include Mr. W. J. U. Woolcock, Professor G. G. Henderson, and the Bishop of Birmingham.

DR. HARVEY W. WILEY, formerly Chief of the American Bureau of Chemistry, was recently the guest at a dinner arranged by the American Association of Official Agricultural Chemists to celebrate his eightieth birthday. Dr. Wiley was instrumental in securing the passing of the Food and Drugs Act after many years' work as reformer.

THE MAIN COMMITTEE of the British Engineering Standards Association has recently authorised the secretary, Mr. le Maistre, to accept the invitation of the German Standards Committee (the N.D.I.) to be present at their annual meeting on December 13. He is also going to Prague to give an address on " Industrial Standardisation " before the recently formed Czechoslovakian Standards Committee.

THE FIRST RESEARCH MEDAL offered by the Staffordshire Iron and Steel Institute has been awarded to Mr. Francis G. Dodd, of Walsall, for a paper on " Grain Growth in Mild Steel." Mr. Dodd was a student at Wednesbury Technical College, and in connection with developments initiated by the Principal (Mr. D. H. Ingall) was the first to engage in metallurgical research as a student of that college. He is in the employ of the Patent Shaft and Axle Tree Co.

A GENERAL MEETING of the members of the Royal Institution was held on Monday. The thanks of members was returned to Dr. W. Rushton Parker for his donation of £100 towards the improvement of the library. Professors Theodore Lyman, of Harvard University, and Gilbert H. Lewis, of the University of California, were elected honorary members, and Professor E. N. da C. Andrade, Mrs. M. H. Daniell, Dr. G. C. Simpson, Dr. D. P. Subotic, and Mr. W. J. U. Woolcock were elected members of the Institution.

REPORTS FROM GERMANY state that Professor F. Paschen, formerly director of the Physical Institute of the University of Tübingen, has been installed as president of the Physikalisch-Technische Anstalt, Berlin. The appointment of Herr Geheimrat Wiedfeldt, German Ambassador to Washington, to the head of the directorate of the firm of Krupp in Essen-Ruhr is also announced. Dr. Bruhn retires from the board of directors in order to become the representative of Krupps in Berlin, in succession to Dr. Kurt Sorge, who has resigned.

A PORTRAIT OF JOHN DALTON has been presented by Miss Ethel M. Scott to the Chemical Department of Manchester University.

MR. C. E. PEARSON has been appointed lecturer in metallurgy at Armstrong College, Newcastle. He is a Carnegie Research Scholar.

THE PROVISION OF CHEMISTRY AND PHYSICS departments at an early date has been agreed to by the Council of Leicester University College.

FIRE IN A SULPHUR MINE situated between Somantini and Riesi, Sicily, on Tuesday last is reported to have thrown 700 miners out of work.

A NEW BUILDING for the manufacture of fine chemicals is in course of erection at the works of the British Drug Houses, Ltd., in City Road, London, N.

THE NEW LABORATORIES of Dr. S. P. Schotz, consulting research chemist and chemical engineer, are at 48, Newcomen Street, London Bridge, London, S.E.1.

A LOAN OF £500,000 TO POLISH SUGAR PRODUCERS has been advanced by a British financial group against the guarantee of the Polish Bank of National Economy.

THE ASSOCIATION OF PRODUCERS OF NITRATE OF SODA in Chile intend to organise a central research department in that country, and are advertising for a director of research at £3,000 per annum and two sub-directors at £2,500 per annum.

MR. L. K. OSMOND, principal of the firm of Osmond and Son, Ltd., manufacturing chemists, Grimsby, Osmond and Son (New Zealand), Ltd., Osmond's Fertiliser Co., Ltd., and the Gasonite Co., Ltd., has been appointed to the Commission of the Peace for the borough of Grimsby.

POISONING BY FLUOSILICIC ACID has resulted in several deaths in Germany recently. The acid has been sold as a pest exterminator, and the authorities were apparently unaware of its poisonous properties, as no special mention is made of the acid in the Prussian police regulations relating to poisons.

BALDWINS, LTD., are contemplating the removal of their Blackwall works to a country site owing to the disturbed state of labour. The works are at present held up, and an office staff had to be organised to ladle over 100 tons of molten metal from the galvanising baths left in that state by strikers who are claiming an increase of 10s.

MR. JUSTICE ROMER, in the Chancery Division on Monday, granted an injunction restraining Amata, Ltd., Leda Hall, and Kenneth Conrad Ralph, from selling toilet preparations under the name of " Amata " or any other name which was a colourable imitation of the registered word " Amami " used by the firm of Pritchard and Constance (Wholesale), Ltd., by whom the action was brought.

A MEETING OF CHEMICAL AND DYESTUFFS MERCHANTS, organised by the British Chemical and Dyestuffs Traders' Association, Ltd., will be held in the Accountants' Hall, Manchester, on the afternoon of Friday, December 12. Mr. Frederick T. Reynolds will preside, and an address is to be given on the Association's activities in connection with Safeguarding of Industries Act, 1921; the Dyestuffs (Import Regulation Act), 1920; Reparation dyestuffs; the German (Reparation Recovery) Act; and other matters.

IT IS OFFICIALLY ANNOUNCED that the ownership of the Cooper Roller Bearings Co., King's Lynn, has recently changed, and the new proprietors have appointed Mr. C. A. Ablett, M.Inst.C.E., as managing director. The company manufacture the Cooper Patent Roller Bearings and the Cooper Patent Friction Clutch in a large range of standard sizes. These specialities will continue to be manufactured on an extended scale, and every effort will be made to maintain the cordial business relationships which have existed in the past. Mr. C. A. Ablett is also the managing director of the Unbreakable Pulley and Millgearing Co., Ltd., of Manchester.

MR. FRED T. T. REYNOLDS, governing director of Millwards Merchandise, Manchester, and vice-chairman of the British Chemical and Dyestuff Traders' Association, has been presented by the executive committee of the Southport Liberal Association with a silver casket as a mark of their appreciation of his nine years' chairmanship of the Committee and a silver dessert dish has been given to Mrs. Reynolds. A resolution has been passed congratulating Sir John Brunner on his gallant fight at the last election, and inviting him once again to become the prospective Liberal candidate for the constituency. Sir John is to be entertained to a complimentary dinner in January.

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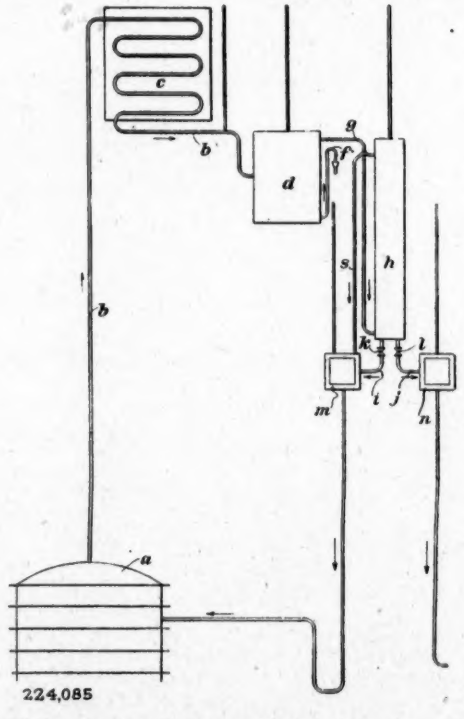
Abstracts of Complete Specifications

223,997. CONTAINERS FOR THE STORAGE OF ACIDS, CORROSIVE LIQUIDS AND THE LIKE. The New Eccles Rubber Works, Ltd., and S. W. Cox, Monton Road, Eccles, Lancs. Application date, August 3, 1923.

In the manufacture of acid-proof containers, the container has been made of metal coated internally with vulcanite or the like in the plastic condition and then vulcanised. This method is costly and not always satisfactory, since air may be trapped between the surface of the metal and the vulcanite during the covering process, and this air expands during the vulcanising process. The vulcanite lining may thus be thin in places and liable to breakage due to the pressure of the acid. In this invention, a solid container of ebonite or vulcanite is constructed and left upon the metal former. The whole structure is then lowered upon a brick foundation covered with a layer of cement just before the ebonite container is placed in position. The latter thus becomes embedded and supported in the cement. An outer wall of brick is constructed around the container leaving a cavity between its sides and the ebonite walls. Cement is then poured into the cavity so as to completely fill it and thus form a continuous support for the ebonite container. The metal former is finally removed from the container. In some cases the brickwork may be dispensed with, and the container supported by the concrete filling only which is placed in position within a temporary outer support.

224,085. FRACTIONAL DISTILLATION, PROCESS OF. Dorman, Long and Co., Ltd., 2, Zetland Road, Middlesbrough, J. A. Roelofsen, "Hillcrest," Saltburn, Yorks, and H. M. Lowe, 19, Granville Road, Middlesbrough. Application date, November 3, 1923.

In the separation of volatile liquids by distillation in which a reflux condenser or dephlegmator is used, the separation of the components has been considered to be due to the fractional condensation of the less volatile components and their return



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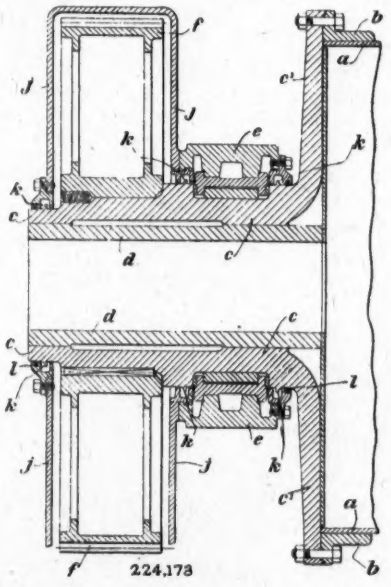
to the still. It has since been found that the extent of separation is governed not by the amount of liquid returned to the still, but by the ratio between this amount and the amount of distillate which passes forward. In this invention the reflux ratio is maintained at a predetermined and adjustable amount irrespective of the variation in the amount of distillation and pressure in the still.

Vapour passes from the fractionating column *a* through a pipe *b* to a condenser *c* and then to an automatic separator *d*, which separates the water of condensation when steam is employed to effect the distillation of a liquid immiscible with water. The water is run off through a pipe *f* and the condensate through a pipe *g* to a dividing box *h*. The condensate passes from the box in two streams, one back to the column *a* through the pipe *i*, and the other to a receiving tank for the distillate through the pipe *j*. The rates of flow of these two streams are regulated by valves *k*, *l*, which control the flow through two sight boxes *m*, *n*. The latter may be provided with measuring notches to indicate the flow. The vessel *m* is arranged at such a height that the condensate returns to the column *a* by gravity against the pressure in the column. The valves *k*, *l* are adjusted to give the reflux ratio required according to the purity of the distillate required. If an increase in the rate of distillation occurs, the liquid level in the vessel *h* rises and larger quantities of distillate flow through the valves *k*, *l*, but the ratio remains the same. As alternatives to the valves *k*, *l*, adjustable slits or V-notches may be provided in the sides of the vessel *h*, and this vessel may then be of less height. Vent pipes may be provided at various points in the system where indicated.

224,173. TUBE MILLS, ROTARY KILNS, ROTARY SCREENS AND THE LIKE. David Brown and Sons (Huddersfield), Ltd., and W. H. Child, Park Gear Works, Lockwood, Huddersfield. Application date, May 22, 1924.



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Tube mills and analogous machines such as rotary kilns, screens or graders are usually supported at the ends on trunnion bearings through which the material is fed, and the mill is driven through a toothed wheel mounted on the end of one of the trunnions. The toothed wheel is usually subjected to rapid wear due to the presence of fine particles of the material to be ground or otherwise treated, and such material also finds its way into the bearings. The object of this invention is to avoid these disadvantages. The casing *a* is provided with the usual flanged end ring *b* to which the flange *c* of the hollow trunnion *d* is bolted. The trunnion is provided with a liner *d* and an oil-tight bearing *e* of the Mitchell type, and carries a driving gear wheel *f* at its outer end. The wheel *f* is surrounded by a casing *j* which abuts against the outer side of the bearing *e* and is provided with oil catchers *k* and felt rings *l*. Oil is supplied under pressure to the bearings.

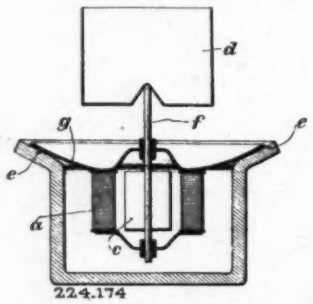
This construction prevents any material fed in through the hollow trunnion *c* from finding its way to the gears or the bearings, so that the apparatus is more durable and requires less driving power.

224,077. Dyeing Acetyl Cellulose or Fabrics containing the same and New Products for use therein. British Dyestuffs Corporation, Ltd., 70, Spring Gardens, Manchester, and J. Baddiley, A. Shepherdson, H. Swann, J. Hill, and L. G. Lawrie, Crumpsall Cale Chemical Works, Blackley, Manchester. Application date, October 19, 1923.

Specification No. 211,720 (see The Chemical Age, Vol. X, p. 333) describes the dyeing of acetyl silk with amino anthraquinones together with an emulsifying agent or protective colloid such as soap or turkey-red oil. It is now found that the best protective colloid or dispersing agent available is a condensation product of naphthalene with formaldehyde in sulphuric acid solution, or naphthalene sulpho-acids with formaldehyde. The dyes are obtained by mixing together substantially insoluble colouring matters having affinity for acetyl silk with the above condensation products, and the necessary quantity of water. The products are pastes and act in the same manner as if the dyestuff were soluble, or the products may be evaporated and powdered. The powders may be mixed with direct cotton dyestuffs for dyeing mixed materials. In an example, the protective colloid may be produced by sulphonating naphthalene 1 part with sulphuric monohydrate 1 part for ten hours at 160° C., and the product diluted with water 0·4 parts and cooled. Then the product is heated to 80°–85° C., mixed with 40 per cent. formaldehyde 0·3 parts, and condensation continued for six hours at 95°–100° C. Water 0·6 parts and 38 per cent. caustic soda solution 0·6 parts are then added. This dispersing agent may be mixed with 10 per cent. of the mono azo dyestuff obtained by diazotising paranitraniline and combining with diphenylamine. Another example is given of a dye produced from 1 : 4-diamino anthraquinone.

224,174. Centrifugal Machines. C. G. T. Salenius, Bohus Sweden. Application date, May 23, 1924.

This centrifugal machine is of the kind employed for separating liquids of different specific gravity, or liquids from finely



224.174

divided solid material. Such machines may be driven at 6,000–12,000 revolutions per minute, at which speed it is necessary to avoid any vibrations or quick oscillations, and the object of this invention is to secure this condition. The machine is driven by an electric motor comprising a stator *a* and rotor *c* having a vertically projecting shaft *f* driving the rotary drum or vessel *d*. The motor is carried by a spherical member *g* which rests freely on a similar supporting surface *e*. The weight of the vessel *d* is such that the centre of gravity of the system is above the surface *e* but is below the centre of curvature of the surface *e*. The connection between the shaft *f* and vessel *d* is such that the vessel is capable of free oscillation about a point which is fixed relatively to the shaft. The system is thus capable of two movements in addition to rotation: (1) The oscillation referred to above; and (2) the oscillation of the motor about the centre of curvature of the surface *e*. When this apparatus is driven at high speed neither of these oscillations takes place, and the moving parts rotate without shocks or vibration.

224,179. Carbonising Coal and Other Fuels. Spencer-Bonecourt, Ltd., and W. Gregson, Parliament Mansions, Victoria Street, London, S.W.1. Application date, May 28, 1924.

In the carbonisation of coal in retorts with introduction of steam, the steam generator has been heated by the waste heat from the retort flues. The waste heat boilers should be worked on induced draught, which, together with the draught requirements of the retort setting and regenerators, necessitate the use of one or more exhausters. If the exhausters are driven by a reciprocating steam engine, or a steam turbine, only small power is necessary and such small engines are not efficient. The object of this invention is to enable the inefficient small engine to be employed in a more efficient manner. The steam from the waste heat boiler is used in the engine and is discharged from it at about 30 lb. per square inch, and then passes through a steam separator to dry it, and thence into the retorts. Before passing into the retorts, the steam is passed through a superheater in the inlet products chamber of the waste heat boiler or the superheater may be separately heated.

Note.—Abstracts of the following specifications which are now accepted, appeared in The Chemical Age when they became open to inspection under the International Convention:—207,162 (Soc. of Chemical Industry in Basle) relating to the manufacture of naphthalene derivatives and dyestuffs, see Vol. X., p. 101; 210,463 (Durand and Huguenin Akt.-Ges.) relating to manufacture of diazo dyestuffs, see Vol. X., p. 390; 216,110 (W. Ostermann and Sudenburger Maschinenfabrik und Eisingiesserei Akt.-Ges.) relating to the mechanical production of colloidal substances, see Vol. XI., p. 101; 219,272–3 (Nederlandsche Gist.-en Spiritusfabriek) relating to a process of producing chemically pure ether, see Vol. XI., p. 298.

International Specifications not yet Accepted.

222,514. Lactic Acid and Yeast. A. Pollak, 50, Smolagasse, Vienna. International Convention date, September 29, 1923.

Sugar solution is fermented while passing through a series of vats at a controlled speed, and the acid solution is withdrawn continuously or intermittently and replaced by fresh solution. The product may be used for making yeast, after adding ammonia, which combines with the acid. The solution containing lactic acid or a nitrogenous compound may be sterilised or not before use for yeast production.

222,815. Treating Ores. P. Gredt, 34, Markplatzring, Luxemburg. International Convention date, October 3, 1923. Addition to 206,509. (See The Chemical Age, Vol. X., Metallurgical Section, p. 14.)

Part of the gangue may be removed from oolitic, marly, or like iron ores by a preliminary treatment in which the calcareous material is calcined by heat and then slaked. The material is then subjected to friction, and then to blast-sifting to remove the gangue.

222,821. Lead Carbonate. A. Nathansohn, 6, Goslarischestrasse, Bad Harzburg, Germany. International Convention date, October 3, 1923.

Lead compounds containing chlorine are mixed with lime and water to precipitate the lead. If the lead compound is solid it is suspended in water and agitated with lime till no lead remains in solution. Carbon dioxide is then introduced, yielding lead carbonate free from chlorine.

Latest Notifications.

225,160. Process for the manufacture and production of cyanides from alkali-earth cyanamides. Fabriques de Produits Chimiques de Thann et de Mulhouse. November 24, 1923.

225,187. Manufacture of hafnium and zirconium compounds. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 15, 1923.

225,206. Process for the preparation of a solution of cyanamide from commercial calcium cyanamide. Compagnie de l'Azole et des Fertilisants Soc. Anon. November 20, 1923.

Specifications Accepted with Date of Application

200,816. Alkali celluloses, Process of preparing—and the preparation of cellulose ethers therefrom. L. Lilienfeld. July 13, 1922.

200,827. Low-water content alkali cellulose, Process of preparing—and the preparation of cellulose ethers therefrom. L. Lilienfeld. July 13, 1922.

202,311. Liquid hydrocarbons, Process of conversion of gaseous aliphatic ethylene hydrocarbons into. Ricard, Allenet et Cie. August 9, 1922.

206,822. Hydrogen, Process of manufacture of. L'Oxhydrique Française. November 7, 1922.

209,100. Complex ores containing zinc, Treatment of. C. Clerc and A. Nihoul. December 28, 1922.

210,761. Dehydrating alcohol, Process of. Ricard, Allenet et Cie. February 3, 1923.

213,586. Distillation of solid or liquid matters, Apparatus for. H. Dupuy. March 29, 1923. Addition to 198,661.

214,951. Calcium arsenate, Process for the manufacture of. Soc. Chimique des Usines du Rhône. April 27, 1923.

216,098. Arsenates of the alkaline earth metals, Process for the manufacture of. Soc. Chimique des Usines du Rhône. May 15, 1923.

216,129. Hydrochloric acid free from arsenic, Process for obtaining. E. Schmidt and Ges. für Chemische Produktion. May 14, 1923.

217,197. Liquids, Installation for the separation of. S. Karpinsky and J. S. Anderson. June 7, 1923.

219,287. Light metal from scrap, Process for recovering. Chemische Fabrik Griesheim Elektron and A. Beielstein. July 20, 1923. Addition to 182,948.

224,568. Carbonaceous and other materials, Distillation or treatment of. P. M. Salerni and E. M. Salerni. May 15, 1923.

224,656. Purifying or softening of water by means of base-exchanging compounds, and the regeneration of such compounds when spent. T. P. Hilditch, H. J. Wheaton and J. Crosfield and Sons, Ltd. September 24, 1923.

224,688. Gasolene from natural gas or hydrocarbon vapours, Method and apparatus for separating. J. W. Chadwick. October 18, 1923.

224,697. Sulphate of ammonia, Method and apparatus for the production of dry and commercial neutral. S. Henshaw, S. Stonier, and Talk o' th' Hill Colliery, Ltd. October 24, 1923.

224,734. Centrifugal liquid separators. J. V. M. Risberg. December 4, 1923.

224,764. Salts of the p-oxyacyl amino arsinic acids, Process for the preparation of. G. B. Ellis. (Soc. Chemique des Usines du Rhône.) January 22, 1924.

Applications for Patents

Albert, A., and Deutsche Gasglühlicht Auer Ges. Production of unsymmetrical arseno-compounds. 28,158. November 24.

Albert, A., and Deutsche Gasglühlicht Auer Ges. Production of derivatives of organic arseno-compounds. 28,589. November 28.

Badische Anilin-and-Soda-Fabrik and Johnson, J. Y. Manufacture of carbonyl compounds. 28,349. November 26.

Berthon, P., and Soc. de Stearinerie et Savonnerie de Lyon. Manufacture of soluble cellulose esters. 28,576. November 28.

Billinghame, W. E. Emulsification of tar, bitumen, &c. 28,395. November 27.

Blumenfeld, J., and Mayer, M. Preparation of titanium pigments. 28,557, 28,558. November 28.

Crosland, F. Kiln for calcining lime, cement, etc. 28,409. November 27.

Farbwerke vorm. Meister, Lucius, and Brüning. Calcining, etc., furnaces. 28,114. November 24. (Germany, November 29, 1923.)

Farbwerke vorm. Meister, Lucius, and Brüning. Calcining, etc., furnaces. 28,465. November 27. (Germany, January 18.)

Gensecke, W., and Metallbank und Metallurgische Ges. Akt. Ges. Distillation of fatty acids, etc. 28,155. November 24. (Germany, November 28, 1923.)

Heneage, E. Apparatus for distillation of lignites, etc. 28,570. November 28.

Imray, O. Y. (International Combustion Engineering Corporation). Pulverizing and drying of materials. 28,602. November 28.

Laing, B., and Nielsen, H. Purification of carbonaceous materials, etc. 28,468. November 27.

Lomax, E. L., and U.L. Oil Processes, Ltd. Methods of separating phenols. 28,138. November 24.

Luty, D., and Smith, E. Chemical fire-extinguisher valves. 28,052. November 24.

Mexco, Ltd., and Scott, A. C. Explosives. 28,670. November 29.

Neill, J. O. Production of glues, etc. 28,222. November 25.

Schryver, S. B. Manufacture of gelatine. 28,676. November 29.

Patents Court Case

Application has been made under Section 24 of the Patents and Designs Acts, 1907 and 1919, for the following patent to be indorsed "Licences of Right":—172,944 (Aktieselskabet Labrador) relating to the precipitation of iron in mineral acid alumina solutions. This indorsement means that any person may obtain a licence under this patent.

Chemical Methods for Measuring Steam.

In an article in *De Ingineur*, entitled "The Gasworks on the Trekvliet, the Hague," is described an innovation in gasworks installations in which the heat of the waste gases from the retort settings, after leaving the recuperators, is utilised for steam-raising purposes, natural draught alone being employed. The feed water is preheated by utilising the heat contained in the cooling water of the ammonia plant. Heat economy is also effected on the water-gas plant, which is fitted with a waste-heat boiler. A Balcke steam accumulator is also provided to enable all the exhaust steam from the continuously-working turbo-blowers and other engines to be used economically for the intermittent water-gas process.

The most interesting feature of the article is the description of the steam-measuring device. In this method, which was developed in 1921, ammonia solution of known strength is injected under pressure at one point in a steam main, and a sample stream of the resulting vaporised mixture is taken off and condensed at a point about 30 ft. further downstream. The ratio of ammonia to water in this sample is determined by titration with sulphuric acid. The total quantity of steam passed during the test is then determined by multiplying the weight of ammonia injected by the ratio of water to ammonia as determined by titration, after due allowance has been made for the strength of the solution injected. The ratio by weight of ammonia to steam should be between 1 in 1,000 and 1 in 10,000, which is quite harmless to fittings of brass or gun-metal. The rate of injection need not be absolutely uniform, provided sampling be carried out during the major portion of the test. The sampling hole should be at the top of the main, to ensure that water particles in the steam are not drawn off with the sample. The presence of water particles in the steam does not cause error, as ammonia is practically insoluble in water at temperatures above 150° C. (302° F.). The method, when checked by direct condensation of the steam, was found to be accurate to within plus or minus 1·5 per cent. The ammonia solution was forced into the steam by compressed air or nitrogen. The quantity injected was measured volumetrically by means of a gauge-glass fitted to the side of the ammonia vessel.

"Oliver" Filters and Pumps

The "Oliver" filter is a widely known device for filtering liquids continuously under vacuum. It was the first of its kind, and was developed in the first instance for filtering cyanide sludge in gold and silver mining. A catalogue recently issued by the makers, the Oliver Continuous Filter Co., of San Francisco, New York and London, shows the various types which have been developed for industrial filtration. The liquids which are now being filtered by the Oliver include every type which is adaptable to filtration under vacuum, not excepting corrosive liquors. The filter consists of a hollow drum carrying the filter cloth protected with a wire mesh, and dipping in a bath of the liquid being handled. A vacuum is applied to the section immersed, and the solid is collected on the cloth. As the drum rotates the solid is exposed, and dries under the reduced vacuum. Washing sprays may be played on the filter cake as it reaches the top of the circuit, and the liquid, after passing to the inside of the drum, may be led off as desired. The dried cake is then scraped off, and if desired dry air can be blown through the cake from the inside of the drum before it is removed.

The same firm also supplies pumps and compressors of various types—one of the most interesting of which is a centrifugal pump carried out in a special acid-resisting material known as "Olivite." This has a rubber base, but is claimed to have properties not found in any other material. It is hard but not brittle and has a high tensile strength.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing those firms' independent and impartial opinions.

London, December 4, 1924.

TRADE has been somewhat uneventful this week, but prices are well maintained, while the volume of business continues satisfactory. Export demand remains in a healthy condition.

General Chemicals

ACETONE is in fair demand and is quoted at £91 to £92 per ton.

ACID ACETIC.—This market is steadier and to-day's price is £41 to £42 for 80% technical, and £43 per ton for pure.

ACID CITRIC continues lifeless with the price nominally 1s. 3d. per lb.

ACID FORMIC is strong and is quoted at £53 per ton wharf.

ACID LACTIC.—The improved demand continues and price is unchanged at £43 per ton for 50 per cent. by weight.

ACID OXALIC.—This article has an improved outlook and the demand is good, price is steady at 4d. per lb.

ACID TARTARIC continues dull and the price is without change at 11¾d. to 1s. per lb.

ALUMINA SULPHATE is steady with a fair business passing at £7 2s. 6d. for 17/18%.

ARSENIC.—There has been some small inquiry although not a great amount of business is yet in evidence. Cornish is steady at £42 per ton, while some of the cheap Japanese parcels appear to have been absorbed.

BARIUM CHLORIDE is unchanged at £12 per ton.

COPPER SULPHATE.—Unchanged in value and there is a fair demand at round about £23 per ton.

CREAM OF TARTAR continues active and the price is £80 per ton.

FORMALDEHYDE.—Although no further decline is reported, this article still continues weak owing to the poor demand. Price is nominally £58 per ton.

EPSOM SALTS are strong and in brisk request at £5 per ton.

LEAD ACETATE.—The higher figure is maintained and it is quoted at £47 per ton for white, and £44 per ton for brown.

LEAD NITRATE.—The price here is unchanged and it is in moderate request at £43 10s. per ton.

LIME ACETATE.—Business is still extremely brisk and the price is a turn higher at £14 per ton for grey.

MAGNESIUM CHLORIDE.—Unchanged.

METHYL ALCOHOL.—Only a small business is reported with spot price at £60 per ton, but this might be slightly shaded for larger quantities.

POTASSIUM BICHROMATE is in steady demand at 5d. per lb.

POTASSIUM CARBONATE AND CAUSTIC.—Unchanged.

POTASSIUM PERMANGANATE.—Fairly firm at 7d. to 7¼d. per lb.

POTASSIUM PRUSSIATE keeps very firm and the price is inclined to go higher; the present value is 7½d. per lb.

SODIUM ACETATE continues brisk and the price is very firm at £23 10s. per ton.

SODIUM BICHROMATE unchanged in value and in fair demand at 4d. per lb.

SODIUM HYPOSULPHITE continues brisk and good quantities are moving off at the market figure of £9 10s. for commercial.

SODIUM NITRITE continues steady at £25 per ton.

SODIUM PRUSSIATE is much harder and is quoted to-day at 4¼d. to 4⅜d. per lb.

SODIUM SULPHIDE.—Unchanged.

Coal Tar Products

There is little change to report in the market for coal tar products since last week.

90% BENZOL remains very firm at 1s 8d. per gallon on rails, and prices have a continued upward tendency.

PURE BENZOL is quoted at 2s. per gallon on rails.

CRESOTE OIL is firm at 5¼d. to 5½d per gallon on rails in the North, while the price in London is from 6d. to 6¼d. per gallon.

CRESYLIC ACID has no great inquiry, and the price remains unchanged. The pale quality 97/99% is quoted at 1s. 11d. to 2s. per gallon on rails, while the dark quality 95/97% is quoted at 1s. 7d. to 1s. 8d. per gallon on rails.

SOLVENT NAPHTHA is firm at 1s. 3d. to 1s. 4d. per gallon on rails.

HEAVY NAPHTHA is quoted at 1s. to 1s. 1d. per gallon on rails.

NAPHTHALENES are unchanged, the low qualities being quoted at £3 10s. to £4 per ton, while 76/78 quality is quoted at £6 to £6 10s. per ton, with the 74/76 quality at £5 10s. to £6 per ton.

PITCH remains firm and prices are well maintained. To-day's values are:—52s. 6d. to 55s., f.o.b. London; 50s. to 52s. 6d., f.o.b. East Coast and West Coast ports.

Nitrogen Products Market

EXPORT.—During the last week the market has remained quiet and prices are unchanged at £13 15s. per ton, f.o.b. for prompt delivery, and £14 to £14 10s. per ton for forward delivery.

The demand from foreign countries is such that there is no doubt that these prices will be maintained for the remainder of the season. Whether these prices will be raised or not depends on the extent of the American demand. They have commenced importing, but the extent of such importations is the doubtful factor in the market.

HOME TRADE.—Prices have now been announced for the remainder of the season, and the producers have adhered to their usual policy of raising prices as the spring advances. The prices are:—

£14 8s. per ton for December,
£14 10s. per ton for January,
£14 12s. per ton for February,
£14 14s. per ton for March/May,

for neutral quality, 4-ton lots, delivered consumers' nearest station, basis 21·1 per cent. nitrogen. Home bookings continue to be on a heavier scale than last year.

NITRATE OF SODA.—The nitrate of soda market is unchanged, prices still ranging from £11 15s. to £11 18s. for prompt, and £11 18s. to £12 4s. per ton for later arrivals. During the week the market has been very quiet.

Sulphate of Ammonia Prices

THE Sulphate of Ammonia Federation announces that the price of sulphate of ammonia for home agricultural use for future delivery will be as follows: 1925, January, £14 10s. (per ton); February, £14 12s.; March-May, £14 14s. These prices are for neutral quality in fine friable condition, free from lumps, basis 21·1 per cent. nitrogen. The January figure represents an advance of 2s. per ton on the December price. Limited quantities of ordinary quality will be available in some districts and will be sold at 23s. per ton less than the above prices, basis 20·7 per cent. nitrogen, but in most parts of the country only neutral is now made. All contracts will contain the usual clause prohibiting export.

A circular from the Federation states that the quantity of sulphate of ammonia sold for home use during the past five months already exceeds by 40 per cent. the total sold for the corresponding period in 1923.

Welding Repairs for Machinery

AN interesting illustrated booklet has just been issued by Barimar, Ltd., whose patent welding process is now well known. Illustrations in the book show how broken machine parts of cast iron and cast aluminium, such as motor cylinders and crank cases, or machined steel such as crankshafts, can be repaired by the Barimar process even when portions are missing, and made "as good as new." Some of the jobs which the firm specialise in include the filling up of scores in cylinders due to wear or flaws in the original casting. Where flaws or blowholes appear in a casting they may successfully be filled up by the Barimar process, even when they are so bad that the casting would otherwise have to be discarded. It may be noted that all Barimar repairs are guaranteed. The firm has five depots in England and Scotland, the head office being in London at 14, 16 and 18, Lamb's Conduit Street, W.C.1.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at sellers' works.

General Heavy Chemicals

Acid Acetic 40% Tech.—£23 10s. per ton.
Acid Boric, Commercial.—Crystal, £45 per ton. Powder, £47 per ton
Acid Hydrochloric.—3s. 9d. to 6s. per carboy d/d., according to purity, strength and locality.
Acid Nitric 80° Tw.—£21 10s. to £27 per ton, makers' works according to district and quality.
Acid Sulphuric.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 65s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.
Ammonia Alkali.—£6 15s. per ton f.o.r. Special terms for contracts.
Bleaching Powder.—Spot, £11 d/d. ; Contract, £10 d/d. 4 ton lots.
Bisulphite of Lime.—£7 10s. per ton, packages extra.
Borax, Commercial.—Crystal, £25 per ton. Powder, £26 per ton. (Packed in 2-cwt. bags, carriage paid any station in Great Britain.)
Calcium Chloride.—£5 17s. 6d. per ton d/d.
Copper Sulphate.—£25 per ton.
Methylated Spirit 64 O.P.—Industrial, 2s. 7d. to 2s. 11d. per gall. Mineralised, 3s. 8d. to 4s. per gall., in each case according to quantity.
Nickel Sulphate.—£38 per ton d/d. Normal business.
Nickel Ammonia Sulphate.—£38 per ton d/d. Normal business.
Potash Caustic.—£30 to £33 per ton.
Potassium Bichromate.—5½d. per lb.
Potassium Chlorate.—3d. to 4d. per lb.
Salammoniac.—£32 per ton d/d.
Salt Cake.—£3 10s. per ton d/d.
Soda Caustic, Solid.—Spot lots delivered, £16 7s. 6d. to £19 7s. 6d. per ton, according to strength ; 20s. less for contracts.
Soda Crystals.—£5 5s. to £5 10s. per ton ex railway depots or ports.
Sodium Acetate 97/98%.—£24 per ton.
Sodium Bicarbonate.—£10 10s. per ton carr. paid.
Sodium Bichromate.—4½d. per lb.
Sodium Bisulphite Powder 60/62%.—£17 to £18 per ton, according to quantity, f.o.b., 1-cwt. iron drums included.
Sodium Chlorate.—3d. per lb.
Sodium Nitrate refined 96%.—£13 5s. to £13 10s. per ton, ex Liverpool. Nominal.
Sodium Nitrite 100% basis.—£27 per ton d/d.
Sodium Sulphide conc. 60/65.—About £14 10s. per ton d/d.
Sodium Sulphide Crystals.—£9 per ton d/d.
Sodium Sulphite, Pea Crystals.—£15 per ton f.o.r. London, 1-cwt. kegs included.

Coal Tar Products

Acid Carbolic Crystals.—5½ to 6d. per lb. Quiet. Crude 60's, 1s. 7d. to 1s. 9d. per gall. Market quiet but fairly steady.
Acid Cresylic 97/99.—1s. 11d. to 2s. 1d. per gall. Fair business. Pale 95%, 1s. 8d. to 1s. 11d. per gall. Dark, 1s. 7d. to 1s. 9d. per gall. Market dull.
Anthracene Paste 40%.—4d. per unit per cwt. Nominal price. No business.
Anthracene Oil, Strained.—6½d. to 7½d. per gall. Small demand. Unstrained, 6d. to 6½d. per gall.
Benzol.—Crude 65's.—7½d. to 9d. per gall., ex works in tank wagons. Standard Motor, 1s. 1½d. to 1s. 3d. per gall., ex works in tank wagons. Pure, 1s. 5½d. to 1s. 7d. per gall., ex works in tank wagons.
Toluol.—90%, 1s. 5½d. to 1s. 7d. per gall. More inquiry. Pure, 1s. 7d. to 1s. 9d. per gall. Steady demand.
Xylol Commercial.—2s. 3d. per gall. Pure, 3s. 3d. per gall.
Creosote.—Cresylic, 20/24%, 8d. to 8½d. per gall. More inquiry. Middle Oil, Heavy, Standard specification, 5½d. to 6½d. per gall., according to quality and district. Market firmer. Steady demand.
Naphtha.—Crude, 8d. to 9d. per gall. Solvent 90/160, 1s. 3d. to 1s. 4d. per gall. Demand good. Higher prices probable. Solvent 90/190, 11½d. to 1s. 1d. per gall. Demand maintained.
Naphthalene Crude.—Demand rather better. Cheaper in Yorkshire than in Lancashire. Drained Creosote Salts, £3 to £5 per ton. Steady, but quiet. Whizzed or hot pressed, £6 to £9 per ton. No business.
Naphthalene.—**Crystals and Flaked,** £12 to £15 per ton, according to districts.
Pitch.—**Medium soft,** 47s. 6d. to 60s. per ton, according to district. Plenty of inquiry. Prospects brighter.
Pyridine.—90/160, 18s. 6d. to 19s. per gall. Steady business. **Heavy,** 11s. 6d. to 12s. Steady.

Intermediates and Dyes

Business in dyestuffs has been maintained but without further improvement. Prices remain unaltered.

In the following list of Intermediates delivered prices include packages except where otherwise stated.

Acetic Anhydride 95%.—1s. 7d. per lb.
Acid H.—3s. 10d. per lb. 100% basis d/d.
Acid Naphthionic.—2s. 2d. per lb. 100% basis d/d.
Acid Neville and Winther.—5s. 8d. per lb. 100% basis d/d.
Acid Salicylic, technical.—1s. 1d. per lb. Good demand.
Acid Sulphanilic.—9d. per lb. 100% basis d/d.
Aluminium Chloride, anhydrous.—1s. per lb. d/d.
Aniline Oil.—8d. per lb. naked at works.
Aniline Salts.—8d. per lb. naked at works.
Antimony Pentachloride.—1s. per lb. d/d.
Benzidine Base.—3s. 10d. per lb. 100% basis d/d.
Benzyl Chloride 95%.—1s. 1d. per lb.
p-**Chlorphenol.**—4s. 3d. per lb. d/d.
p-**Chloraniline.**—3s. per lb. 100% basis.
o-**Cresol 29/31° C.**—3½d. to 4½d. per lb. Easier.
m-**Cresol 98/100%.**—2s. 1d. to 2s. 3d. per lb. Demand moderate.
p-**Cresol 32/34° C.**—2s. 1d. to 2s. 3d. per lb. Demand moderate.
Dichloraniline.—3s. per lb.
Dichloraniline S. Acid.—2s. 6d. per lb. 100% basis.
p-**Dichlorbenzol.**—£85 per ton.
Diethylaniline.—4s. 3d. per lb. d/d., packages extra, returnable.
Dimethylaniline.—2s. 2½d. per lb. d/d. Drums extra.
Dinitrobenzene.—9d. per lb. naked at works.
Dinitrochlorbenzol.—£84 10s. per ton d/d.
Dinitrotoluene.—48/50° C. 8d. to 9d. per lb. naked at works 66/68° C. 1s. 2d. per lb. naked at works.
Diphenylaniline.—2s. 10d. per lb. d/d.
G. Salt.—2s. 3d. per lb. 100% basis d/d.
Monochlorbenzol.—£63 per ton.
a-**Naphthol.**—2s. 4d. per lb. d/d.
B-**Naphthol.**—1s. per lb. d/d.
a-**Naphthylamine.**—1s. 3½d. per lb. d/d.
B-**Naphthylamine.**—4s. per lb. d/d.
m-**Nitraniline.**—4s. 2½d. per lb. d/d.
p-**Nitraniline.**—2s. 2½d. per lb. d/d.
Nitrobenzene.—5½d. to 5¾d. per lb. naked at works.
o-**Nitrochlorbenzol.**—2s. 11d. per lb. 100% basis d/d.
Nitronapthalene.—10d. per lb. d/d.
p-**Nitrophenol.**—1s. 9d. per lb. 100 % basis d/d.
p-**Nitro-***o*-**amido-phenol.**—4s. 6d. per lb. 100% basis.
m-**Phenylene Diamine.**—4s. per lb. d/d.
p-**Phenylene Diamine.**—10s. per lb. 100% basis d/d.
R. Salt.—2s. 4d. per lb. 100% basis d/d.
Sodium Naphthionate.—2s. 2d. per lb. 100% basis d/d.
o-**Toluidine.**—10d. per lb.
p-**Toluidine.**—2s. 10d. per lb. naked at works.
m-**Toluylene Diamine.**—4s. per lb. d/d.

Wood Distillation Products

There is a general feeling that the fall in price of acetates during the last few weeks has reached its limit. The tendency is now to stiffen again.

Acetate of Lime.—Brown £11 5s. per ton d/d. and upward. Grey, £14 10s. to £15 10s. per ton. Firmer. Liquor, 9d. per gall. 32° Tw.
Charcoal.—£7 5s. to £9 per ton, according to grade and locality. Demand better in many localities.
Iron Liquor.—1s. 7d. per gall. 32° Tw. 1s. 2d. per gall. 24° Tw.
Red Liquor.—10d. to 1s. per gall. 14/15° Tw.
Wood Creosote.—2s. 9d. per gall. Unrefined.
Wood Naphtha, Miscible.—4s. 9d. per gall. 60% O.P. Solvent, 5s. to 5s. 3d. per gall. 40% O.P. Firmer.
Wood Tar.—£4 10s. to £5 10s. per ton. Demand slack and stocks being held.
Brown Sugar of Lead.—£42 per ton. Steady market.

Rubber Chemicals

Antimony Sulphide.—Golden, 6½d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 4d. to 1s. 6d. per lb., according to quality.
Arsenic Sulphide, Yellow.—1s. 11d. per lb.
Barytes.—£3 10s. to £6 15s. per ton, according to quality.
Cadmium Sulphide.—3s. 9d. to 4s. per lb., according to quantity.
Carbon Bisulphide.—£30 to £33 per ton, according to quantity.
Carbon Black.—7d. to 7½d. per lb., ex-wharf.
Carbon Tetrachloride.—£60 to £65 per ton, according to quantity, drums extra.
Chromium Oxide, Green.—1s. 3d. per lb.
Indiarubber Substitutes, White and Dark.—5d. to 9½d. per lb Demand very brisk. Prices likely to remain steady owing to firmness of rapeseed oils.
Lamp Black.—£48 per ton, barrels free.
Lead Hyposulphite.—7½d. per lb.
Lithopone, 30%.—£22 10s. per ton.
Mineral Rubber "Rubpron."—£16 5s. per ton f.o.r. London.

Sulphur.—£10 to £12 per ton, according to quality.
Sulphur Chloride.—4d. per lb., carboys extra.
Sulphur Precip. B.P.—£50 to £65 per ton.
Thiocarbanilide.—2s. 6d. per lb.
Vermilion, Pale or Deep.—5s. 1d. per lb. Dearer.
Zinc Sulphide.—7½d. to 1s. 8d. per lb., according to quality

Pharmaceutical and Photographic Chemicals

Acid, Acetic 80% B.P.—£45 per ton ex wharf London in glass containers.
Acid, Acetyl Salicylic.—3s. 1d. to 3s. 3d. per lb., according to quantity. Sales steady. Price firm.
Acid, Benzoic B.P.—2s. 6d. per lb.
Acid, Boric B.P.—Crystal £51 per ton, Powder £55 per ton. Carriage paid any station in Great Britain.
Acid, Camphoric.—19s. to 21s. per lb.
Acid, Citric.—1s. 3d. per lb., less 5% for ton lots. Increased export inquiry.
Acid, Gallic.—2s. 9d. per lb. for pure crystal, in cwt. lots Easier.
Acid, Pyrogallic, Crystals.—7s. per lb. for 1 cwt. lots. Resublimed quality 8s. per lb. Market firm.
Acid, Salicylic.—1s. 6d. to 1s. 7d. per lb., according to quantity.
Acid, Tannic B.P.—2s. 10d. per lb. Forward quotations higher. Spot value likely to increase.
Acid, Tartaric.—1s. per lb., less 5%.
Amidol.—9s. per lb. d/d.
Acetanilide.—1s. 10d. to 2s. per lb. More inquiry.
Amidopyrin.—14s. 6d. per lb. for spot stocks.
Ammonium Benzoate.—3s. 3d. to 3s. 6d. per lb., according to quantity.
Ammonium Carbonate B.P.—£37 per ton.
Atropine Sulphate.—12s. 6d. per oz. for English make.
Barbitone.—13s. 9d. per lb. Slightly lower. Quiet steady demand.
Benzonaphthol.—5s. 3d. per lb. spot.
Bismuth Salts.—Prices reduced by about 1s. 3d. to 2s. 3d. per lb. on account of the fall in the price of the metal.
Bismuth Carbonate.—8s. 6d. to 10s. 6d. per lb.
Bismuth Citrate.—8s. 6d. to 10s. 6d. per lb.
Bismuth Salicylate.—8s. 0d. to 10s. per lb.
Bismuth Subnitrate.—7s. 7d. to 9s. 7d. per lb.
Borax B.P.—Crystal £29, Powder £30 per ton. Carriage paid any station in Great Britain.
Bromides.—Potassium, 1s. 11d. per lb.; sodium, 2s. per lb.; ammonium, 2s. 1d. per lb. Very scarce and dear. Prices uncertain.
Calcium Lactate—1s. 7d. to 2s., according to quantity. Fair demand and steady market.
Chloral Hydrate.—4s. per lb.
Chloroform.—2s. 6d. per lb. for cwt. lots.
Creosote Carbonate.—6s. 6d. per lb. Little demand.
Formaldehyde.—£48 to £49 per ton, in barrels ex wharf London. Supplies exceed demand.
Glycerophosphates.—Fair business passing. Calcium, soluble and citrate free, 7s. per lb.; iron, 8s. 9d. per lb.; magnesium, 9s. per lb.; potassium, 50%, 3s. 6d. per lb.; sodium, 50%, 2s. 6d. per lb.
Guaiacol Carbonate.—9s. 6d. per lb.
Hexamine.—3s. per lb. For bold crystal. Powder slightly less.
Homatropine Hydrobromide.—25s. to 30s. per oz.
Hydrastine Hydrochloride.—English make offered at 120s. per oz.
Hydroquinone.—4s. 3d. per lb. in cwt. lots. Foreign make.
Hypophosphites.—Calcium, 3s. 6d. per lb., for 28 lb. lots; potassium, 4s. 1d. per lb.; sodium, 4s. per lb.
Iron Ammonium Citrate B.P.—1s. 11d. to 2s. 3d. per lb. Prices recently reduced.
Magnesium Carbonate.—Light Commercial, £36 per ton net. Light pure, £46 per ton.
Magnesium Oxide.—Light Commercial, £75 per ton, less 2½%; Heavy Commercial, £25 per ton, less 2½%; Heavy Pure, 2s. to 2s. 3d. per lb., according to quantity. Steady market.
Menthol.—A.B.R. recrystallised B.P., 57s. per lb., for December deliveries. No spot deliveries available. Synthetic, 26s. to 35s. per lb. according to quality, English make. Increasing demand.
Mercurials.—Market very quiet. Red oxide, 5s. 2d. to 5s. 4d. per lb.; Corrosive sublimate, 3s. 5d. to 3s. 7d. per lb.; white precipitate, 4s. 6d. to 4s. 8d. per lb.; Calomel, 3s. 10d. to 4s. per lb.
Methyl Salicylate.—1s. 9d. to 2s. per lb.
Methyl Sulphonel.—22s. 6d. per lb. Slightly weaker.
Metol.—11s. per lb. British make.
Morphine and Salts.—Reduced by 1s. to 1s. 3d. per oz.
Paraformaldehyde.—2s. 8d. for B.P. Quality.
Paraldehyde.—1s 2d. to 1s. 6d. per lb., in free bottles and cases.
Phenacetin.—5s. 6d. per lb.
Phenazone.—6s. 10d. per lb. [demands.
Phenolphthalein.—5s. 6d. per lb. for cwt. lots. Supply exceeds
Potassium Bitartrate 99/100% (Cream of Tartar).—84s. per cwt. less 2½% for ton lots.
Potassium Citrate.—1s. 10d. to 2s. 2d. per lb.
Potassium Ferricyanide.—1s. 9d. per lb. Quiet.
Potassium Iodide.—16s. 8d. to 17s. 5d. per lb., according to quantity. Steady market.
Potassium Metabisulphite.—7½d. per lb., 1-cwt. kegs included, f.o.r. London.
Potassium Permanganate.—B.P. crystals, 7½d. per lb., carriage paid; commercial, 8d. to 8½d. per lb., carriage paid. Forward prices higher.
Quinine Sulphate.—2s. 3d. to 2s. 4d. per oz., in 100 oz. tins. Steady market.
Resorcin.—5s. 3d. per lb.
Saccharin.—63s. per lb. in 50-lb lots.
Salol.—3s. 6d. per lb., for cwt. lots. Slightly lower, limited demand.
Silver Proteinate.—9s. per lb. for satisfactory product light in colour.
Sodium Benzoate, B.P.—2s. 6d. per lb. Supplies of good quality available.
Sodium Citrate, B.P.C., 1923.—1s. 11d. to 2s. 2d. per lb., according to quantity.
Sodium Hypophosphite, Photographic.—£13 to £15 per ton, according to quantity, d/d. consignee's station in 1-cwt. kegs.
Sodium Metabisulphite Crystals.—37s. 6d. to 60s. per cwt., net cash, according to quantity.
Sodium Nitroprusside.—16s. per lb.
Sodium Potassium Tartrate (Rochelle Salt).—75s. to 82s. 6d. per cwt., according to quantity. Market quiet.
Sodium Salicylate.—Powder, 2s. 1d. to 2s. 3d. per lb. Crystal, 2s. 2d. to 2s. 4d. per lb. Flake, 2s. 6d. per lb. Good demand, market firmer.
Sodium Sulphide, pure recrystallised.—10d. to 1s. 2d. per lb.
Sodium Sulphite, anhydrous, £27 10s. per ton, minimum 5 ton lots, according to quantity, 1 cwt. kegs included.
Sulphonal.—14s. 6d. per lb. Little demand.
Thymol.—18s. per lb. Firmer market.

Perfumery Chemicals

Acetophenone.—11s. 3d. per lb.
Aubepine.—13s. 6d. per lb. Again cheaper.
Amyl Acetate.—3s. per lb.
Amyl Butyrate.—6s. 6d. per lb.
Amyl Salicylate.—3s. 3d. per lb.
Anethol (M.P. 21/22° C.).—4s. 6d. per lb.
Benzyl Acetate from Chlorine-free Benzyl Alcohol.—2s. 9d per lb.
Benzyl Alcohol free from Chlorine.—2s. 9d. per lb.
Benzaldehyde free from Chlorine.—3s. 3d. per lb. Cheaper.
Benzyl Benzoate.—3s. 6d. per lb.
Cinnamic Aldehyde Natural.—18s. 6d. per lb.
Coumarin.—18s. 3d. per lb. Cheaper.
Citronellol.—18s. per lb. Dearer.
Citral.—8s. per lb.
Ethyl Cinnamate.—12s. 6d. per lb.
Ethyl Phthalate.—3s. per lb.
Eugenol.—10s. 6d. per lb.
Geraniol (Palmarosa).—33s. 6d. per lb.
Geraniol.—12s. 6d to 20s. per lb.
Heliotropine.—6s. 9d. per lb.
Iso Eugenol.—16s. per lb.
Linalol ex Bois de Rose.—26s. per lb.
Linalyl Acetate.—26s. per lb.
Methyl Anthranilate.—10s. per lb.
Methyl Benzoate.—5s. per lb.
Musk Ambrette.—50s. per lb.
Musk Xylol.—14s. per lb.
Nerolin.—4s. 6d. per lb.
Phenyl Ethyl Acetate.—15s. 6d. per lb.
Phenyl Ethyl Alcohol.—16s. per lb.
Rhodinol.—52s. 6d. per lb. Cheaper.
Safrol.—1s. 10d. per lb.
Terpineol.—2s. 4d. per lb.
Vanillin.—25s. 6d. per lb.

Essential Oils

Almond Oil, Foreign S.P.A.—15s. 6d. per lb.
Anise Oil.—2s. 10d. per lb.
Bergamot Oil.—15s. 6d. per lb. Cheaper.
Bourbon Geranium Oil.—32s. per lb. Cheaper.
Camphor Oil.—65s. per cwt.
Cananga Oil, Java.—11s. 3d. per lb. Dearer.
Cinnamon Oil, Leaf.—6½d. per oz.
Cassia Oil, 80/85%.—9s. 9d. per lb.
Citronella Oil.—Java, 85/90%, 7s. per lb. Dearer. Ceylon, 3s. 5d. per lb. Cheaper.
Clove Oil.—8s. 3d. per lb.
Eucalyptus Oil, 70/75%.—2s. 2d. per lb. Cheaper.
Lavender Oil.—French 38/40% Esters, 35s. per lb.
Lemon Oil.—3s. 2d. per lb.
Lemongrass Oil.—5s. 9d. per lb. Dearer.
Orange Oil, Sweet.—11s. per lb.
Otto of Rose Oil.—Bulgarian, 42s. 6d. per oz. Dearer. Anatolian, 28s. per oz. Dearer.
Palma Rosa Oil.—17s. per lb. Dearer.
Peppermint Oil.—Wayne County, 43s. 6d. per lb. Japanese, 22s. 6d. per lb. Nominal.
Petitgrain Oil.—9s. 9d. per lb.
Sandal Wood Oil.—Mysore, 26s. 7d. per lb. Australian, 18s. 6d. per lb.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

Glasgow, December 4, 1924.

DURING the past week the Heavy Chemical Market has shown some little improvement, quite a fair amount of inquiry going around both for home consumption and for export. Prices for Continental products remain steady, but home manufacturers advise one or two reductions for next year, notably caustic soda and bleaching powder.

Industrial Chemicals

ACID ACETIC.—Glacial 98/100%, £57 to £68 per ton according to quality and packing. 80%, pure, quoted £44 to £46 per ton. 80%, technical, £43 to £45 per ton, packed in casks, delivered c.i.f. U.K. port, duty free.

ACID BORACIC.—Remains unchanged. Crystal or granulated, £45 per ton; powdered, £47 per ton carriage paid U.K. stations, minimum ton lots.

ACID CARBOLIC, ICE CRYSTALS.—Quoted 5¼d. per lb. delivered, but could probably be obtained for less.

ACID CITRIC, B.P. CRYSTALS.—Rather better inquiry, price now 1s. 4d. per lb., less 5% ex store. Offered for prompt shipment at 1s. 3½d. per lb., less 5% ex wharf.

ACID FORMIC, 85%.—On offer at £50 per ton, c.i.f. U.K. ports, duty free. Spot lots quoted £53 to £54 per ton, ex store.

ACID HYDROCHLORIC.—In little demand, price 6s. 6d. per carboy, ex works.

ACID NITRIC, 80°.—£23 10s. per ton, ex station, full truck loads.

ACID OXALIC, 98/100%.—Unchanged at about 3¾d. per lb., ex store. Offered for prompt shipment from the continent at 3½d. per lb., ex wharf.

ACID SULPHURIC.—144°, £3 12s. 6d. per ton; 168°, £7 per ton, ex works, full truck loads. Dearsenicated quality, 20s. per ton more.

ACID TARTARIC, B.P. CRYSTALS.—Now quoted 11½d per lb., less 5% ex store. Offered for prompt shipment from the continent at 11¼d. per lb., less 5% ex wharf.

ALUMINA SULPHATE, 17/18%, IRON FREE.—On offer at £6 15s. per ton c.i.f. U.K., prompt shipment. Spot lots available at about £7 10s. per ton, ex store.

ALUM.—Potash Chrome Alum, 15% quoted £19 per ton c.i.f. U.K. port, prompt shipment from the continent. Ammonium chrome alum for export quoted £17 per ton f.o.b. U.K. port. Lump potash alum on offer at £9 15s. per ton, ex store. Offered for prompt shipment from the continent at about £8 12s. 6d. per ton c.i.f. U.K. port.

AMMONIA ANHYDROUS.—Unchanged at about 1s. 6d. per lb., ex station, containers extra and returnable, with possible slight reduction for large quantities.

AMMONIA CARBONATE.—Lump, £37 per ton; powdered, £39 per ton, packed in 5 cwt. casks delivered U.K. port.

AMMONIA LIQUID, 880°.—In steady demand. Unchanged at 2½d. to 3d. per lb., delivered, according to quantity, containers extra.

AMMONIA MURIATE.—Grey galvanizer's crystals of English manufacture quoted £30 per ton in casks, £29 per ton in bags, carriage paid stations. On offer from the continent at about £27 per ton c.i.f. U.K. port. Fine white crystals quoted £23 5s. per ton c.i.f. U.K. port.

ARSENIC, WHITE POWDERED.—Spot lots available at about £38 per ton, ex store. Slightly cheaper quotations for early delivery.

BARIUM CARBONATE, 98/100%.—Offered from the continent at about £9 10s. per ton c.i.f. U.K. port.

BARIUM CHLORIDE, 98/100%.—Unchanged at about £12 10s. per ton, ex store, spot delivery. Offered from the continent at about £11 10s. per ton c.i.f. U.K. port.

BARYTES.—English material unchanged at £5 5s. per ton, ex works. Continental quoted £5 per ton, c.i.f. U.K. port.

BLEACHING POWDER.—Spot lots £11 per ton, ex station, contracts 20s. per ton less. Manufacturers advise reduction in price over next year of 10s. per ton.

BORAX.—Granulated, £24 10s. per ton; crystals, £25 per ton; powdered, £26 per ton, carriage paid U.K. stations, minimum ton lots.

CALCIUM CHLORIDE.—English material unchanged at £5 12s. 6d. per ton, ex station; continental material on offer at about £5 per ton, ex store.

COPPERAS, GREEN.—Unchanged at about £3 5s. per ton, ex works, packed in casks, free.

COPPER SULPHATE.—In little demand, British material for export quoted about £24 10s. per ton, f.o.b. U.K. port. Continental available on spot at about £23 10s. per ton, ex store.

FORMALDEHYDE, 40%.—Unchanged at about £49 per ton, ex store.

GLAUBER SALTS.—English material unchanged at £4 per ton, ex store or station. Continental material now quoted slightly above this figure, c.i.f. U.K. ports.

LEAD, RED.—Imported material unchanged at about £44 10s. per ton, ex store.

LEAD, WHITE.—Unchanged at about £46 per ton, ex store, spot delivery.

LEAD ACETATE.—Quoted £46 10s. per ton, ex store, spot delivery. Brown on offer from the continent at about £41 per ton, c.i.f. U.K. port.

MAGNESITE CALCINED.—Unchanged at about £7 17s. 6d. per ton, ex station, prompt delivery. Hard burnt quality quoted £4 15s. per ton, ex station. Finer quality of continental manufacture quoted £7 15s. per ton, c.i.f. U.K. port.

MAGNESIUM CHLORIDE.—Offered from the continent at £5 2s. 6d. per ton, c.i.f. U.K. port.

POTASH, CAUSTIC 88/92%.—Spot material inclined to be scarce, but some available at about £32 per ton, ex store.

POTASSIUM BICHROMATE.—Spot price unchanged at 5½d. per lb. delivered. Price from January 1, 1925, ½d. per lb. less.

POTASSIUM CARBONATE 96/98%.—Continental prices firmer, at about £23 per ton c.i.f. U.K. port. Spot lots available at about £24 10s. per ton, ex store.

POTASSIUM CHLORATE.—Spot material unchanged at about 2¾d. per lb., ex wharf. On offer for prompt shipment from the continent at 2½d. per lb., c.i.f. U.K. port.

POTASSIUM NITRATE, SALTPETRE.—Quoted £26 per ton, c.i.f. U.K. port, prompt shipment from the continent. Spot lots on offer at £28 15s. per ton, ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Quoted 8d. per lb., ex store, spot delivery. Offered for prompt shipment from the continent at about 7½d. per lb., ex wharf.

POTASSIUM PRUSSIATE, YELLOW.—Rather better inquiry and price maintained at 7d. per lb., ex store.

SODA CAUSTIC.—76/77%, £19 7s. 6d. per ton; 70/72%, £17 17s. 6d. per ton; 60/62%, broken, £19 2s. 6d. per ton; 98/99%, powdered, £22 15s. per ton. All ex station spot delivery. Contracts 20s. per ton less. Some manufacturers advise the following reductions for next year:—76/77%, 27s. 6d. per ton; 70/72%, 25s. per ton; 98/99%, powdered, 27s. 6d. per ton.

SODIUM ACETATE.—Spot lots unchanged at about £23 10s. per ton, ex store. On offer from the continent at about £22 10s. per ton, c.i.f. U.K. port.

SODIUM BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station, M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Spot price unchanged at 4¼d. per lb., delivered. Reduction of ½d per lb from January 1 next.

SODIUM CARBONATE.—Soda Crystals, £5 to £5 5s. per ton, ex quay or station; powdered or pea quality, £1 7s. 6d. per ton more; alkali 58%, £8 12s. 3d. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—English material unchanged at £10 per ton, ex station. Continental quoted £8 10s. per ton, c.i.f. U.K. port. Spot lots available at about £9 15s. per ton, ex store. Pea crystals of English manufacture unchanged at £13 15s. per ton, ex station.

SODIUM NITRATE.—Ordinary quality quoted £13 17s. 6d. per ton ex store; 96/98%, refined quality, 7s. 6d. per ton extra.

SODIUM NITRITE, 100%.—In little demand. Now quoted £25 10s. per ton, ex store.

SODIUM PRUSSIATE, YELLOW.—Moderate inquiry and price unchanged at about 4d. per lb., ex store. Offered for prompt shipment from the continent at about 3¾d. per lb., c.i.f. U.K. port.

SODIUM SULPHATE, SALTCAKE.—Price for home consumption, £3 10s. per ton, f.o.r. works. Good inquiry for export.

SODIUM SULPHIDE.—English manufacturers advise slight advance in prices for next year. 60/65%, solid, £15 per ton; broken, £1 per ton more; flake, £2 per ton more; crystals, 31/34%, £9 5s. per ton, all carriage paid station, minimum 4 ton lots, with a slight reduction for contracts over a period. Continental solid material, 60/62%, quoted £12 10s. per ton, c.i.f. U.K. port; 30/32%, crystals, £8 15s. per ton, c.i.f. U.K. port.

SULPHUR.—Flowers, £9 10s. per ton; roll, £8 10s. per ton; rock, £8 7s. 6d. per ton; ground, £8 5s. per ton, ex store. Prices nominal.

ZINC CHLORIDE.—96/98%, of continental manufacture, quoted £23 per ton, c.i.f. U.K. port. English material for export on offer at about £25 to £26 per ton, f.o.b. U.K. port.

ZINC SULPHATE.—Unchanged at about £12 15s. per ton, ex store, spot delivery.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

ALPHA NAPHTHYLAMINE.—Good export inquiry. Price 1s. 3½d. per lb., f.o.b.

ALPHA NAPHTHOL.—Good export inquiry. Price 2s. 2d. per lb., f.o.b.

BETA NAPHTHOL.—Small home inquiry. Price 1s. 1d. per lb., delivered.

BETA NAPHTHYLAMINE.—Considerable export inquiry. Price 3s. 9d. per lb., f.o.b.

CHICAGO ACID.—Some export inquiry. Price 11s. per lb. 100% basis.

DIPHENYLAMINE.—Small export inquiry. Price 2s. 10d. per lb. f.o.b.

DINITROTOLUOL.—Some export inquiry. Price 11d. per lb. f.o.b.

METANILIC ACID.—Home inquiry. Price 3s. per lb., 100% basis, carriage paid.

META XYLIDINE.—Some home inquiry. Price 5s. per lb., drums included.

META SALICYLIC ACID.—Some export inquiry. Price 8s. 5d. per lb.

ORTHO TOLUIDINE.—Some export inquiry. Price 7d. per lb. f.o.b.

PARA TOLUIDINE.—Some home inquiry. Price 4s. lb., delivered.

PERI ACID.—Good export demand. Price 2s. 8d. lb., 100% basis.

PHENYL PERI ACID.—Some home inquiry. Price 5s. per lb., 100% basis, carriage paid.

PARA PHENYLENE DIAMINE.—Good export inquiry. Price 8s. 6d. per lb., 100% basis, f.o.b.

TOLIDINE BASE.—Good export inquiry. Price 6s. 10d. per lb., 100% basis.

The Manchester Chemical Market

FROM OUR OWN CORRESPONDENT.

Manchester, December 4, 1924.

BUSINESS in chemicals here during the past week has been on rather quiet lines, although the tone of the market remains hopeful. Some home trade orders have been booked for forward delivery, and a fair amount of interest is being shown by consumers in the question of supplies for some distance ahead. Prices are steady on the whole, and only in a few instances is there much perceptible weakness. A feature of interest has been the announcement by makers of a cut from £10 to £9 10s. per ton in the price of "bleach" for next year's deliveries. Demand on export account has been inactive.

Heavy Chemicals

There is still little movement in saltcake either for home consumption or for export, though prices are still on the basis of £3 10s. per ton. Glauber salts are in quiet demand at about the same figure. Phosphate of soda is fairly steady at £13, but not much business is being put through. Soda crystals are in moderate inquiry at £5 5s. per ton. Prussiate of soda is in fair request with values maintained at 4d. per lb. Bichromate of soda is rather quiet at 4¼d. per lb. until the end of the year and 4d. for 1925 delivery. Hyposulphite of soda is not attracting much attention, and quotations are easy at £13 15s. per ton for photographic crystals and £9 5s. to £9 10s. per ton for commercial quality. Caustic soda continues steady at from £16 17s. 6d. per ton for 60 per cent. material to £19 7s. 6d. for 76–77 per cent., a fairly good demand being met with. Bleaching powder is in quietly steady request at £10 per ton and 10s. less for next year's contracts. Alkali is maintained at £6 15s. per ton, and is selling in moderately good quantities. Sulphide of sodium is quiet but unchanged at £14 10s. per ton for 60–65 per cent. concentrated solid, and £9 5s. per ton for crystals. Acetate of soda is maintained at last week's level of £22 10s. per ton, but demand is weak. Bicarbonate of soda is steady and in moderate inquiry at £10 10s. per ton. Chlorate of soda is attracting some attention, and values are held at about 2½d. per lb.

The demand for caustic potash is not particularly brisk, but values are steady at £30 to £31 per ton for 90 per cent. strength. Carbonate of potash is in much the same position, with current quotations round £23 per ton. Permanganate of potash is quiet at 6½d. to 7½d. per lb. according to quality. Yellow prussiate of potash is steady and in fair demand at 6¾d. per lb. Chlorate of potash is still offering at 2¾d. per lb., with business on a comparatively small scale. Bichromate of potash is quoted at 5½d. per lb. until the end of the year, and at 5d. on 1925 contracts.

Arsenic continues to arouse very little buying interest, although a slight improvement in the export position is spoken of; quotations remain very weak, £38 to £39 per ton now being quoted for white powdered, Cornish makes, delivered Manchester. Sulphate of copper is dull and easy at about £24 10s. per ton, f.o.b. Commercial Epsom salts are in fair inquiry, with values held at £4 15s. to £5 per ton, magnesium sulphate, B.P. quality, being offered at round £6 10s. per ton. Acetate of lime is quiet but steady at £15 per ton for grey and £11 for brown. Acetate of lead is in moderate request and very firm in sympathy with the metal at £47 per ton for white and about £44 for brown. Nitrate of lead is steady though in small demand at £42 to £43 per ton.

Acids and Tar Products

Acetic acid has a slightly easier tendency and not much business is being done; 80 per cent. commercial is quoted at £43 and glacial at £68 per ton. Oxalic acid is still quiet and weak at 3⅞d. per lb. Tartaric acid is unchanged at about 11½d. per lb., with citric steady at 1s. 3¾d. to 1s. 4d. per lb.

There is a rather better tone in the market for pitch and values are firmer, business having been done for December delivery at round 55s. per ton. Carbolic acid is a very depressed section, and values are largely nominal; crystal is quoted at 5½d. and crude at 1s. 8d. per gallon. Creosote oil is in moderate demand and price steady at round 5¾d. per gallon. Cresylic acid is maintained at about 2s. 1d. per gallon. Naphthalenes are in small demand at £15 10s. per ton for refined and £5 to £8 for crude. Solvent naphtha is in fairly active inquiry at 1s. 4½d. to 1s. 5d. per gallon.

A Discussion on Stainless Steel

AT a recent meeting arranged by the Junior Institution of Engineers, Mr. J. G. Hopcraft spoke on the subject of "Stainless Steel." He dealt with the methods of working the metal by forging, casting, and rolling, etc., and with the heat treatment. He said that it should be understood that the special properties of stainless steelwere inherent properties and not merely superficial. The properties of withstanding heat and corrosion and remaining bright were produced immediately after tempering and removal of the scale, with polishing if necessary. The fact that the steel had to be heat-treated after being worked imposed a limitation on the size of job which could be undertaken, so that the production of large girders, for instance, was not a commercial proposition at the present time. Stainless steel had good heat-resisting qualities and would not scale up to about 800° C., the effect on the surface being confined to colour effect only. Another trouble encountered at present was the removal of scale from the inside of long tubes and similar inaccessible positions. Stainless steel could not be expected to machine like mild steel, but with the right degree of hardness and a little experience in the use of the tools for the particular job, the turning and screwing, etc., of the metal could be carried out without much difficulty.

A new stainless steel combining a high degree of resistance to corrosion with extreme malleability had recently been brought out under the name of "Stabrite." This metal could be produced in sheets for cold-pressed articles which required no further heat treatment. It could not be hardened, but could be welded, soldered, and brazed fairly easily. Mr. Hopcraft said that the earlier failures of some stainless cutlery were invariably due to wrong heat treatment or wrong forging. Unnecessary allowances were made at first for wear due to polishing knives in machines, a process absent with stainless steel, but now a properly forged blade could be sharpened by any usual means and be entirely satisfactory.

Co-Partnership in Industry

IN the current issue of the *Westminster Bank Review* it is asked if it is not possible to devise methods by which the workers themselves could take a more active part in the financing and control of their native industries? If, for example, the great majority of all classes of Englishmen could be induced to hold shares in home undertakings it would not only mean that a widespread, if shallow, pool of capital would be tapped, but would go a long way to dispel fears of industrial unrest. In a very limited manner this has been done already, inasmuch as several firms have co-partnership schemes in operation. But the proposition, if it is to have any effect at all, demands a far wider application. It is nothing less than that all classes should be encouraged to save and to invest their savings, and to recognise that trade carries with it the possibility of a loss as well as a profit. If this object were achieved the psychological effect would be enormous.

Company News

BRITISH OXYGEN CO.—An interim dividend on account of the year to March 31 next of 9d. per share, or 3¾ per cent., less tax, is announced.

NOBEL INDUSTRIES, LTD.—The directors have declared an interim dividend on the ordinary shares for the year ending December 31, 1924, at the rate of 3 per cent. per annum, less tax, payable on January 7 next.

CASSEL CYANIDE CO.—The net profit, together with the balance from last year, states the report for the year to September 30 last, amounted to £84,796. The directors recommend a final dividend of 9d. per share, making 1s., less tax, for the year, leaving a balance of £14,296 to be carried forward.

PEACHEY LEATHER PRODUCTS, LTD.—A loss of £22,662 is shown in the report covering the first period to September 30. The directors state that it is impossible within the scope of the report to deal adequately with an explanation for this result, but a full statement will be laid before the meeting. The company was formed in 1923 with a capital of £150,000, of which £125,000 has been issued.

LIQUID AIR, LTD.—Particulars of this company were advertised in the Press on Wednesday. The company, which is engaged in the manufacture of oxygen, has an authorised capital of £75,000, divided into 71,500 ordinary shares and 3,500 management shares. All of the latter, which carry double voting rights, are issued, together with 47,847 ordinary shares. Dividends of 10 per cent. and 12½ per cent. respectively have been paid for 1922 and 1923 on the capital then issued. Of the unissued shares, 22,000 are under option until next year.

Tariff Changes

HUNGARY.—Charcoal, peat, peat charcoal, lignite and coal, coke and all kinds of artificial solid fuel manufactured therefrom imported into Hungary are now subject to the Customs manipulation fee of 1 per cent. *ad valorem*.

MOROCCO (FRENCH ZONE).—A Decree, dated September 24, regulates the importation of soap into, and its sale and manufacture in, the French Zone of Morocco. The Decree provides that hard soaps must contain at least 40 per cent. of saponified materials, known commercially as "oil and alkali," "useful materials," or "active principles." The saponified materials will be reckoned in anhydrous fatty acids and alkalis combined (in Na_2O.) Soft soaps destined for sale must contain at least 35 per cent. of saponified materials, which will be reckoned in anhydrous fatty acids and alkalis combined (in K_2O). The importation, exposing for sale, and manufacture of soaps containing less than the fixed minima of saponified materials are prohibited.

The use of resinous substances in the manufacture of hard and soft soaps is permitted, but the substitution of resin for the fatty bodies usually employed must be notified on each piece or bar when the proportion of resin exceeds 5 per cent. of the weight of the fatty materials used. The use of silicate of soda is also permitted, but its presence must be notified to the buyer. The use of inactive materials, without detersive value (talc, starch, etc.) is absolutely prohibited.

PANAMA.—A Decree provides that the duties on bay rum made from alcohol denaturated with formaldehyde, salicylate of soda, or any other poisonous substance, is to pay a Customs duty of 20 cents per litre, in addition to the Consumption Tax.

Ammonium Sulphate on the Farm

A GOOD example of useful publicity is the journal *Farm Notes on Profitable Farming*, issued by the British Sulphate of Ammonia Federation, and edited by Mr. T. H. J. Carroll. While the purpose is to show the special fertiliser values of sulphate, especially the neutral salt, other forms of artificial fertilisers are not ignored, and many examples are given of the striking effects on crop production when sulphate is used in the right proportion in conjunction with superphosphate or potash or both. The use of lime, too, in correcting acidity is not overlooked. The autumn issue is an interesting miscellany of notes, all of them bearing in some way on the vital problem of effective and economical manuring.

New Chemical Trade Marks

Applications for Registration

This list has been specially compiled for us by Mr. H. T. P. Gee, Patent and Trade Mark Agent, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer any inquiries relating to Patents, Trade Marks and Designs.

Opposition to the Registration of the following Trade Marks can be lodged up to December 26, 1924.

451,604. For Dyestuffs. Class 4. Major and Co,, Ltd., 12, Norfolk Street, Strand, London, W.C.2; manufacturers. September 5, 1924. (To be Associated. Sect. 24.)

Opposition to the Registration of the following Trade Marks can be lodged up to January 3, 1925.

"ACCURADIO."

452,673. For chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. Clement Dejehet, 34, Rue de Vergnies, Brussels; manufacturer. October 13, 1924.

"KAMFORITE."

448,918. For a chemical preparation for use as an insecticide and fertiliser. Charles Turney Hensman, trading as Hensman Brothers, Masonic Buildings, Bank Street, Horncastle; manufacturer. June 2, 1924. Advertised before acceptance, the applicant alleging distinctiveness.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

COPPERAS.—Tenders are invited for supply of about 600 tons of good commercial copperas or other soluble iron compound for use as a precipitant of sewage, for Salford Corporation. Price to include delivery of 100 tons a month at the sewage disposal works, Weaste (own siding). Samples to be submitted for analysis. Tenders to Chairman, River Irwell Conservancy Committee, Town Hall, Salford, not later than December 17.

CHEMICALS AND VEGETABLE OILS.—A firm of commission agents in Christiania desires to represent British manufacturers of light and heavy chemicals, drugs and vegetable oils. (Reference No. 569).

PARAFFIN WAX.—A commission agent in Antofagasta wishes to represent British manufacturers of paraffin wax. This is a repetition of a notice of October 16. (Reference No. 581).

CEMENT.—A firm of agents in New Orleans wishes to communicate with British manufacturers of hydraulic, Portland, and white cement. (Reference No. 592.)

SULPHATE OF COPPER, EDIBLE OILS AND FATS.—A firm of commission agents in Philippeville, Algeria, desires to obtain agencies for British firms dealing in edible oils and fats and sulphate of copper. (Reference No. 591)

Fighting Oil Fires

A PAPER by Mr. R. B. Stewart, on "Fire and Fire Protection, particularly in regard to Oil Fires," was read at a meeting of the Institute of Marine Engineers in London on Tuesday.

To deal effectively with an oil fire the air must be excluded by means of a "blanket" of non-combustible gas or some substance that would stand up to and not be broken down or destroyed by the heat. The solution of the problem had been found by applying a layer of foam over the burning oil. The foam was produced by mixing together two chemical solutions. The reaction which took place when the solutions came together caused the combined volume to expand eight to ten times through the generation of carbon dioxides which was held in minute, durable, heat-resisting bubbles, forming a fluffy blanket of foam which would float on any liquid, and cling to any surface. It excluded oxygen and so smothered the fire.

Synthetic Ammonia and Nitrates, Ltd.

VICKERS AND INTERNATIONAL COMBUSTION ENGINEERING, LTD., have received an order from Synthetic Ammonia and Nitrates, Ltd., for a complete boiler house equipment, to include two water tube boilers fired with pulverised fuel, this being the first section of a plant which will eventually be six times the size. The boilers are of the Thompson type, each having 9,000 sq. ft. of heating surface and constructed for a working pressure of 275 lb. per sq. in. and superheat 650° F., the normal evaporation being 50,000 lb. of steam per hour, and the peak load 87,000 lb. Each boiler has an economiser of the Foster type, having 4,000 sq. ft. of heating surface, which will give a temperature rise of 100° F., also a pre-heater of 7,000 sq. ft. to raise the temperature of the air to about 300° F.

The furnace is of the Lopulco type, essential features being the water screen at the bottom for the purpose of collecting the ashes in a dry powdered condition, and water-cooled side walls, each having 100 sq. ft. of heating surface. The fuel will consist of coke and fuel duff which contains 15 per cent. of volatiles, and the air of combustion is pre-heated to about 300° F. in order to ensure good ignition of the mixed fuel. The contract includes a complete coal handling plant to deal with 75 tons of fuels per hour, with an automatic skip hoist to deliver the coal or the coke to independent bunkers; also two conveyor belts to drop either fuel into the receiving hopper, in correct amounts according to the speeds of the belts.

Chemical Firms at Cardiff Exhibition

SEVERAL well-known chemical firms exhibited at the Engineering Exhibition at Cardiff which closes to-day (Saturday).

Brecknell, Munro and Rogers, Ltd., of Bristol, presented all types of electric current-collecting devices for cranes, conveyors, etc., and exhibits particularly suitable to blast furnaces, collieries and tinplate works. An extensive range of lubricants, transformer oils and all grades of pure greases comprised the exhibit of the British Mineral Oil Products, Ltd., particular attention being paid to a product "No-Rust-Ol," intended for use in protecting plant temporarily out of service and for use in shipping machinery abroad. The Chloride Electrical Storage Co., Ltd., of Manchester, presented 30 years' experience in battery construction, while Cross Brothers, Ltd., of Cardiff, demonstrated the "Victaulic Joint."

Oil purifiers formed the subject of a display by the De Laval Chadburn Co., Ltd., of London. The De Laval oil purifier instantaneously removes dirt, water, and other impurities from used oil by centrifugal force, discharging pure oil from one spout, water and the lighter solids from another, and retains the heavier impurities in the sediment pockets in the bowl.

The Feed Water Specialists Co., Liverpool, demonstrated the Algor Colloidal System of boiler-feed water purification. A grade of Algor is formulated suitable to individual requirements after analysis of feed water and investigation of the particular working conditions. Asbestos requisites were shown by the Leyland and Birmingham Rubber Co., Ltd., of Cardiff. Handling plant for all purposes was well exhibited by Strachan and Henshaw, Ltd., of Whitehall, Bristol. "Gripoly" productions, in particular beltings and conveyor bands, were exhibited by Lewis and Tylor, Ltd., of Cardiff.

Chemistry in Agriculture

IT is notoriously difficult to convince the general public of the part played by the chemist in the production of many everyday commodities, but when it comes to fertilisers or pest destroyers for farm or garden the connection is obvious. Chemists have undoubtedly contributed a great deal towards making farming less uncertain in studying the nature of soils and the kinds of fertilisers they require. For many users it is an advantage if a fertiliser of a general kind can be combined with pest-destroying compounds so that only one chemical mixture need be carried. One of the successful mixtures of this kind which has been brought to our notice recently is known as "Kamforite," made by Hensman Bros., of Horncastle. This is made in two grades, for farm or horticultural purposes, the difference being that the latter contains a greater proportion of the insecticidal chemicals. The fertilisers used are, of course, a mixture containing sulphate of ammonia, sulphate of potash and phosphates.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

DUCKHAM (ALEXANDER) AND CO., LTD., London, E.C., manufacturers of petroleum products. (M., 6/12/24.) Registered November 19, charge, to Bank; charged on Wheatsheaf Wharf and 144 and 146, Colwith Road, Hammersmith. *——. August 4, 1924.

FARRAR AND CO. (HONLEY), LTD., dyers and bleachers, etc. (M., 6/12/24.) Registered November 20, debenture, to Bank; charged on property at Honley, also general charge. * Nil. April 25, 1923.

London Gazette, &c.

Company Winding Up Voluntarily

LANKSHEAR, WICKSTEAD AND CO., LTD. (C.W.U.V., 6/12/24.) H. L. Marsh, 26, North John Street, Liverpool, chartered accountant, appointed liquidator, November 21.

New Companies Registered

HOYLAND COKE OVENS AND BY-PRODUCTS CO., LTD. Distillers of coal and coal products, manufacturers of by-products from coal; tar and chemical manufacturers, etc. Nominal capital, £7,500 in 1s. shares. Solicitors: E. A. Woolf and Co., 37, Walbrook, London, E.C.4.

PURE METAL MANUFACTURING CO., LTD. Crushers, smelters, calciners, refiners, etc., of refractory materials and substances of all kinds. Solicitors: Hervey Smith and Sons, 92, Market Street, Hyde.

SITORA, LTD., Standart Works, Lawrence Road, Tottenham, London, N.15. Manufacturers, refiners and producers of mineral and vegetable oils, naphtha, benzine, coal by-products, fertilisers, etc. Nominal capital, £200 in £1 shares.

THE "ANILINE" BRITISH AND EAST EUROPEAN CHEMICAL AND DYE TRADING CO., LTD. Exporters, importers, dealers in and manufacturers of chemicals, aniline and all other dyes, dyeing materials, vegetable and other compounds, pigments, paints, oils, etc. Nominal capital £500 in £1 shares. Solicitors: Swann, Hardman and Co., 10, Norfolk Street, Strand, London, W.C.2.

Chlorine Production in Australia

AT Yarraville, Victoria, the Mount Lyell Chemical Works are developing the production of caustic soda and chlorine by electrolysis, and it is possible that the plant will prove to be the centre of considerable industrial activity.

It is probable, now that liquid chlorine is available in bulk from the recently installed compressor at the Mount Lyell Co.'s Works, that industries requiring this bleaching and purifying agent will be established close to the mother plant and draw their supplies at first hand, as is already being done with sulphuric acid. As Australia develops her woollen, cotton, wood pulp, paper making and other basic manufactures, chlorine will be increasingly in demand, and a great many products now imported from Europe and America will be successfully and economically produced locally.

Another interesting development of this plant is the manufacture of sodium hypochlorite, which has been stabilised at 100 grammes per litre available chlorine, and which can be used for safeguarding rural water supplies where chlorine is not applicable. This product is looked upon as an important steriliser, and is specially suitable for use with foodstuffs. Other compounds are zinc chloride for the manufacture of dry cells, and sulphur monochloride for the treatment of rubber. The plant has also made available hydrochloric acid of a particularly pure quality, which is only obtainable by the electrolytic process.